AD/A-005 314

A COMPACT SUBMERSIBLE WINCH FOR A FAIRED TOWLINE

DEVELOPMENT REPORT, PHASES III AND IV

HYDROSPACE-CHALLENGER, INCORPORATED

PREPARED FOR

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

JANUARY 1975

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A COMPACT SUBMERSIBLE WINCH FOR A FAIRED TOWLINE

DEVELOPMENT REPORT
PHASES III AND IV

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Prepared for
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER
Bethesda, Maryland 20084

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The following personnel who contributed to this program are also recognized: Mr. David Dillon for testing, and Mr. Phillip Donahoe for preliminary design studies, detail design review, and testing.

ABSTRACT

This report documents Phases III and IV of the development of a research model of a submersible winch for high density storage of a faired towline. Phase III encompassed the testing of a sectionally faired cable on the winch and the installation and test of a submersible electric drive motor. These tests demonstrated the functional feasibility of the winch. Phase IV included the preliminary design studies required to select a preferred approach for the equipment required for buoy launching, retrieval and towline streaming, and the detail design of this approach.

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SUMMARY

This report documents the continuing development of a special winch for a submarine communications system. The requirement for this winch was established in a prior study which identified a need for towline fairing in order to satisfy the desired performance specifications. Handling the requisite length of faired towline in the space available meant that a compact, submersible, multiple-layer, concentric-drum winch was necessary. The first two phases of the development of a research model of this winch encompassed the determination of the technological feasibility of the concept through a preliminary design study and critical components investigation, and included detail design, fabrication, assembly, and checkout of the winch. This report documents Phase III and IV of this development.

Phase III encompassed the testing of a sectionally faired cable on the winch, and the installation and test of a submersible electric drive motor. These tests demonstrated the functional feasibility of the winch. Phase IV included the preliminary design studies required to select a preferred approach for the equipment required for buoy launching, retrieval and towline streaming, and the detail design of this approach.

To determine the ability of the SCAT winch to handle a faired cable, a land-based test was conducted. This test demonstrated the adequacy of the guidance techniques employed once the faired cable was properly oriented in its grooving. Difficulty was experienced in aligning the fairing about the cable during transit through

intermediate drums and the slot in the outer housing. The incorporation of a pivoted guide extending through the slot and riding on the fairing and configured to confine the trailing edge of the fairing appears to be the most plausible solution to this problem. The towline installation technique was also satisfactorily demonstrated during this test.

Based upon the prior testing, a submersible electric motor and controller was procured, installed, and functionally tested with the winch. Disassembly of the winch during the installation allowed the internal components to be inspected. Inspection revealed no wear or damages of suspect components from prior testing. Both a submerged and an in air test of the motor were conducted to determine if overheating could be a problem. Tests indicated that coolant should be used if the motor is run at high ambient air temperature for more than one inhaul or payout. The winch and motor functioned satisfactorily as a combination under no load operation.

The winch had always been perceived as the critical component in developing the improved submarine towed communication system for the USS POGY (SSN-647). Once its development had proceeded to the point where the winch's feasibility had been demonstrated through hardware testing, the ancillary equipment portion of the system development was initiated. Several concepts for launching, retrieving the buoy, and towline streaming were investigated. The most promising concept was selected and a contract was awarded to execute a detail design. Due to the nature of the submarine communication mission, an alternate winch design encompassing the SCAT drive was also awarded to the same contractor undertaking the design of the ancillary equipment. Both winches are compatible with the ancillary equipment and the POGY cavity.

In order to provide an entire system, the ancillary equipment must be manufactured in addition to a special pancake type slip ring, a fairing guide for entry to the SCAT winch, and a tension measuring device for the SCAT winch. The integration of the new components into the BIAS control system must also be undertaken. Once this equipment is assembled, complete system testing must be conducted on land and at sea.

SECTION I
INTRODUCTION

The demand for operational communications buoy systems at the higher speeds and/or greater depths posed by newer submarine designs exceeds the capacity of present buoy systems in the fleet. In order to obtain a equate communication depths at higher speeds, the hydrodynamic drag on the towline must be limited by means of cable fairing. The addition of fairing to the towline requires that a mechanism for handling and storing the faired towline must be incorporated into the system.

In order to provide the SSN 594 and 637 Class submarines with a towed communication system that would meet the desired performance levels, two major constraints must be faced. First, the space limitations of the available cavity require a very compact buoy and handling system. This severely limits the design alternatives open to the system engineer. Second, the combination of high towing speed with depth requires a cable fairing to control the drag forces. These constraints act in opposition; the cable fairing requires a more bulky handling system than is needed by the ribbon-type material presently used.

A research model of a submersible multi-layer, concentric drum winch[1*] was developed to attain the desired compactness while protecting the fairing from the stresses of storage on a winch drum.

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* References are listed on Page 6-1.

At the request of the Naval Ship Research and Development Center (NSRDC), Towed Systems Branch, Hydrospace-Challenger, Inc. (HCI) has continued the development of the winch and the remaining elements of the handling system. This report contains an account of the subsequent developments of the towed communication system.

SECTION II
FAIRING TEST

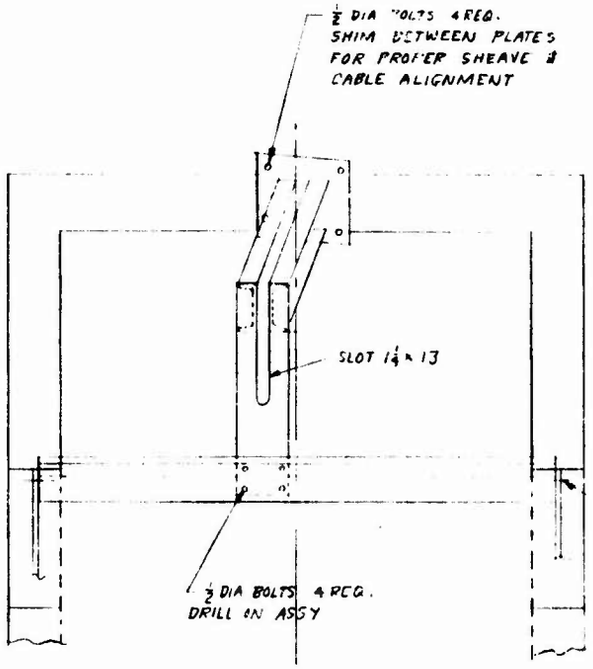
To determine the ability of the SCAT winch to handle a faired cable, a land-based test was conducted to demonstrate the adequacy of the guidance techniques employed, i.e., drum grooving and drum ramps for transfer of cable to the next drum. Towline installation techniques would also be evaluated during this test.

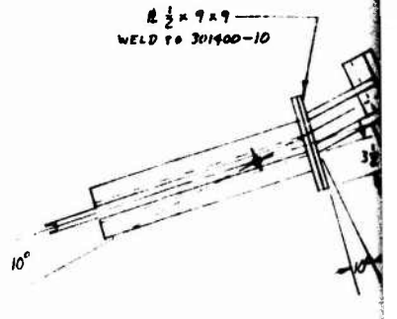
2.1 EQUIPMENT.

The winch was installed on the Western Gear 50-foot test tower and hydraulic driver. To accommodate the faired cable, the lead sheave and its mounting arrangement previously employed for the bare cable test had to be replaced. A deep grooved sheave assembly (20" diameter), used in prior tests, was installed on the winch mounting base as shown in Figure 2-1. This allows under winding of the sheave and eliminates the need for special fairing orientations in the test set up. This necessitated that the cable be at an angle to the tower thereby applying a side load. Due to tower load restrictions, only light loads could be applied in this manner.

A 0.35" diameter double armored cable was partially faired with a NSRDC designed sectional fairing[2] (Figure 2-2). The fairing configuration is as follows:

Cord length	2.406 inches
Thickness	0.488 inches
Section length	2.00 inches
Nose radius (to fit drum contour)	10.00 inches





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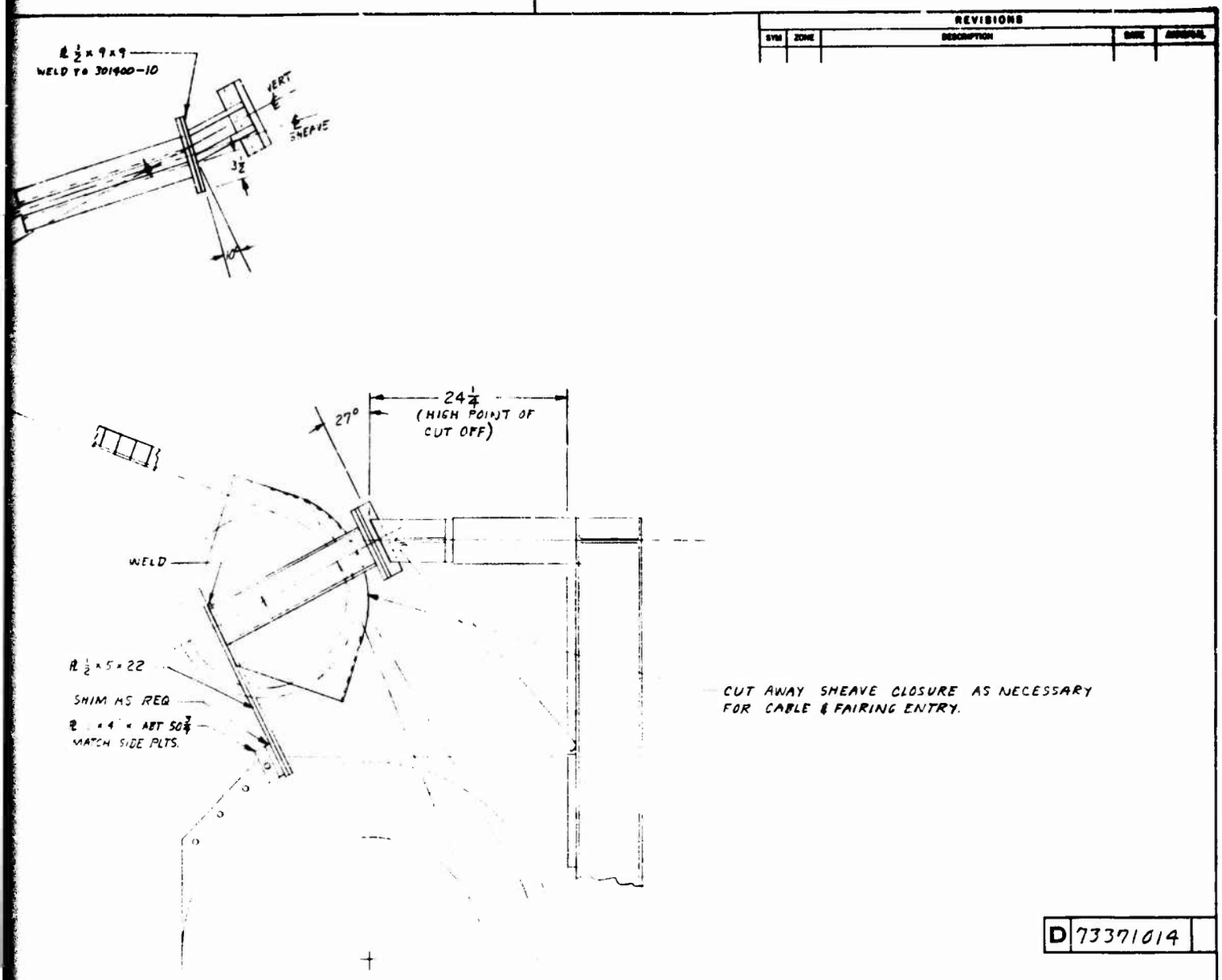

Figure 2-1. SCAT Winch Sheave Installation and Modification

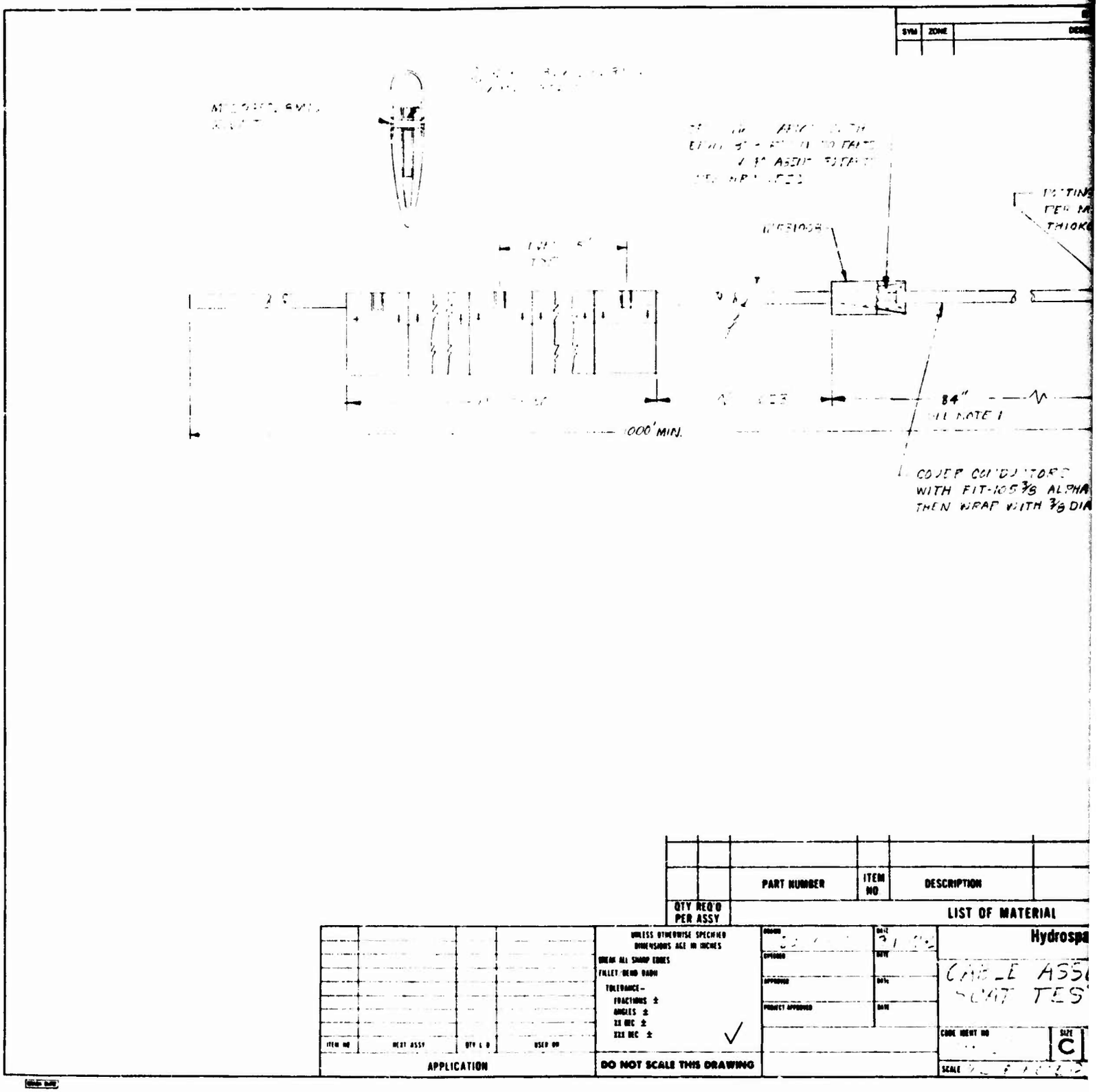
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Figure 2-2.

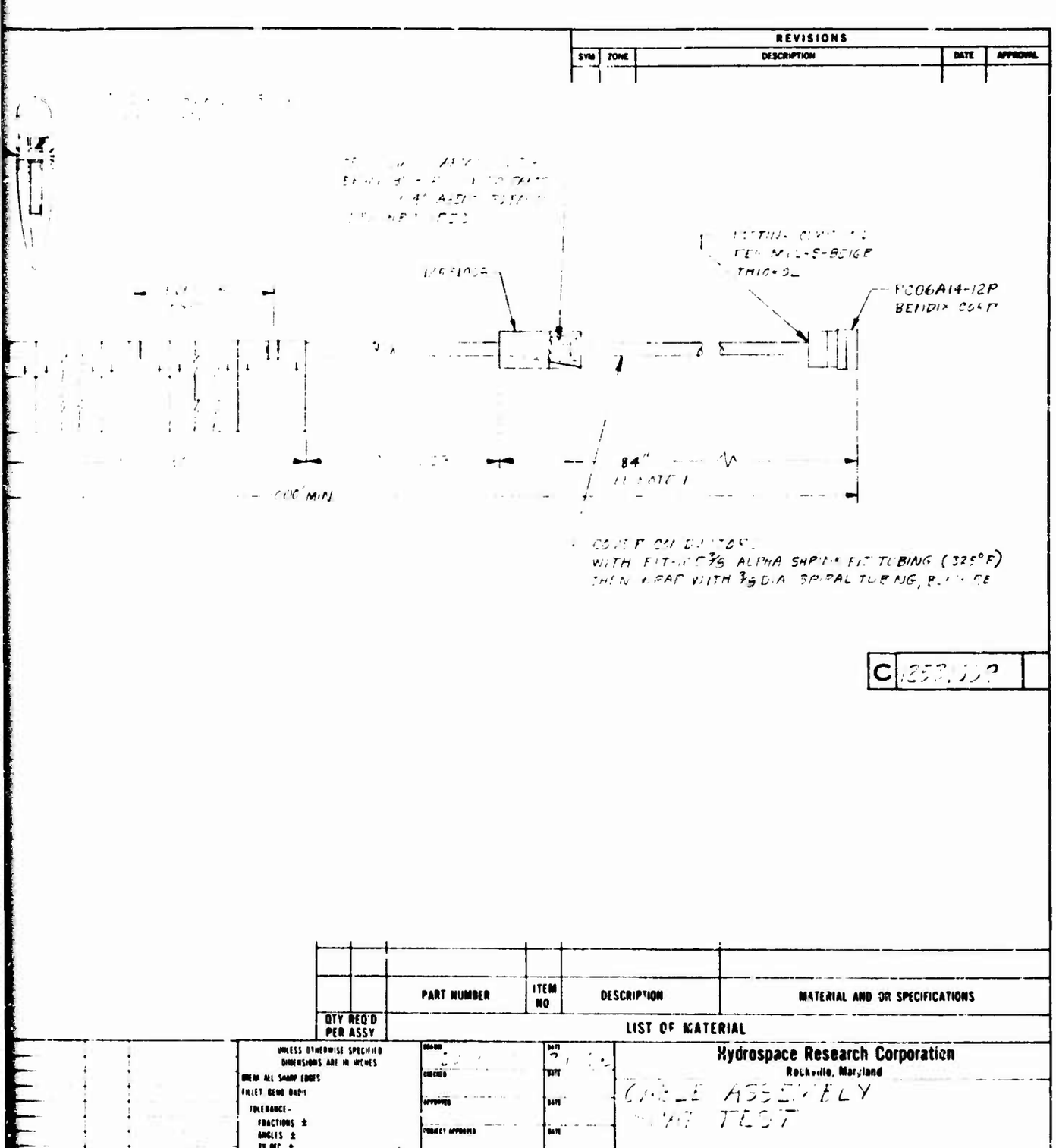


Figure 2-2. SCAT Test Cable Assembly

The fairing's nose and tail pieces were fabricated from 0.032 inch thick stainless steel and lexan respectively.

2.2 PROCEDURE.

The test towline was installed on the SCAT winch and the test tower with 400 pound load applied to the towline. The fairing was positioned along the cable so that it wrapped a few turns prior to and after the transfer ramp between drums 1 and 2. The fairing was then secured to the cable via swaged rings and inhauled through the slot in the outer housing at minimum speed (5 to 10 ft/min). Just prior to the entire 50 foot section being inhauled, the winch was stopped and reversed paying out the previously inhauled fairing. Figure 2-3 shows the fairing coming off the sheave and entering the winch. This process was repeated and the fairing observed for orientation and damage. Reference 3 movie was made during this test.

The fairing was repositioned by cutting the swaged rings and sliding it along the cable so that the ramps between drums 2 and 3 could be evaluated similarly to the ramps between drums 1 and 2.

2.3 DISCUSSION.

As a result of the test, it was concluded that a sectional fairing properly configured could be handled by the SCAT winch provided proper fairing angular position about the cable is maintained. The fairing is intended to wind with its leading edge in a groove on the outer surface of each drum, and its trailing edge captured in the level-wind threads in the inner surface of the next larger drum or the outer housing. The design had intended that, if the fairing entered the slot in the outer housing, such capture was assured. This was not attained during the test due to the lack of control of the

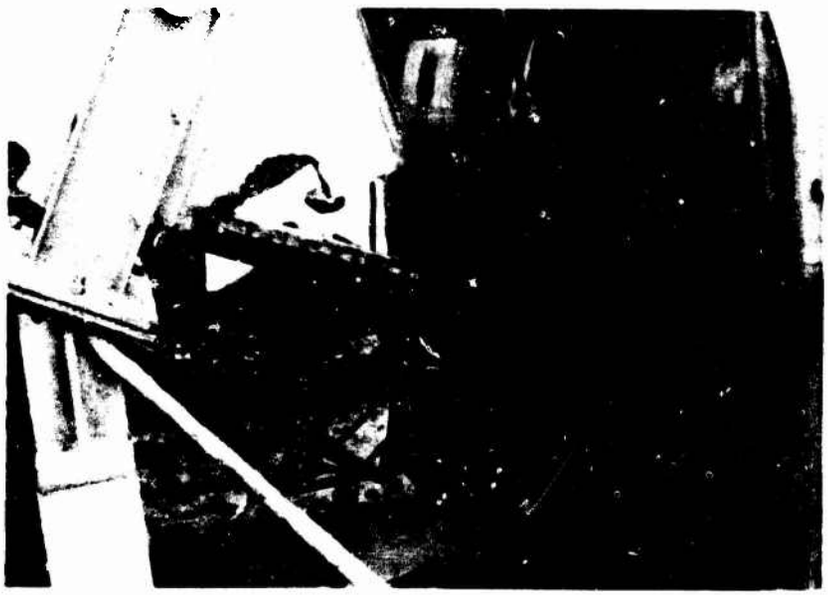


Figure 2-3. Winch With Fairing Entering

trailing edge between the slot in the outer housing and its contact with the drum. This can be attributed to the following:

First, the level-winding thread in the outer housing was improperly manufactured. The threads had been correct in terms of the level-wind function, but metal that was essential to the fairing-guide had been removed. This has been corrected by installation of a guiding groove so that the existing housing can be salvaged.

Second, gravitation force causes the fairing to tend to go to one side of the slot in the outer housing and the drums due to the 10° winch inclination. This, coupled with the helix angle of the level wind threads, allows the trailing edge to enter its adjacent thread.

Adding the guide on the outer shell will not preclude the fairing entering the thread groove adjacent to the proper groove. However, the incorporation of a pivoted guide extending through the slot and riding on the fairing and configured to confine the trailing edge of the fairing appears to be the most plausible solution to this problem.

Installation of the test cable on the winch was not possible due to insufficient clearance between drum 1 cable chute and the inner drum shaft edge rail to allow the electrical connector to pass, and the hand hole in the inner drum being overlooked during manufacturing. By removal of the electrical connector from the end of the electrical core and removal of the center drive tube, the core was installed and secured on the planetary gear reducer end of the winch (Figures 2-4 and 2-5). Little difficulty was experienced connecting the strain termination to the drum receptacle once the core had been installed. No wear or snagging of the core as it slid back and forth between

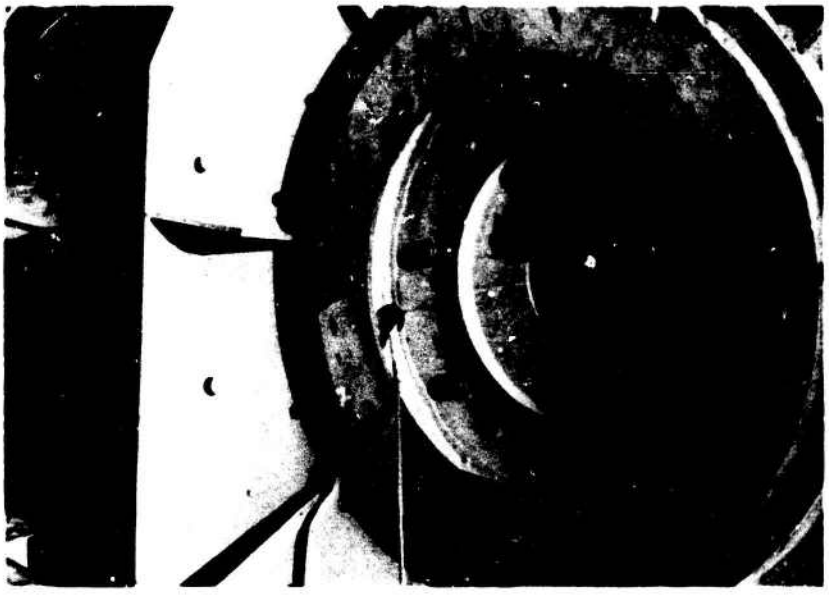


Figure 2-4. Cable Core Feed Through Main Shaft

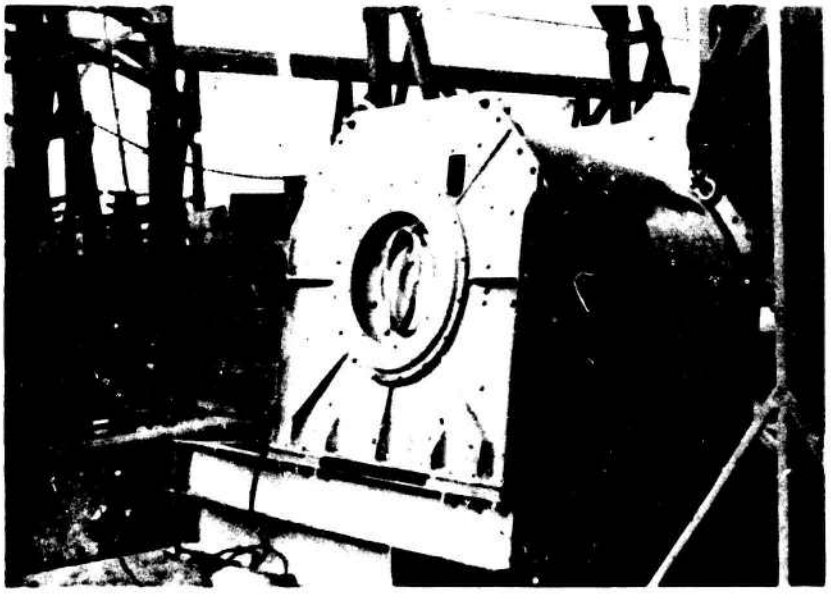


Figure 2-5. Winch On Test Stand with Cable Core Secured

drum 1 and the inner drum shaft was encountered. Relocating the chute and installing the hand hole has been accomplished by the supplier.

No wear or damage to the fairing was detected during any part of the test.

SECTION III
ELECTRIC MOTOR

The winch had been procured less its electric motor since there had existed some doubt as to horsepower and number of speeds required to meet its load and latching requirements. Testing[1] verified the adequacy of the original selected two-speed (900, 1800 rpm) 40/20 horsepower, 400V, 3-phase, 60 Hz submersible electric motor. Therefore, a contract was awarded to Western Gear Corporation to procure, install, and functionally test the winch and motor combination. A suitable controller was also procured for the motor under the same contract.

In order to make the necessary modifications to install the motor and correct the discrepancies uncovered during the fairing tests, the entire winch was disassembled. This afforded an excellent opportunity to inspect the unit for wear. Inspection revealed that one of the ball bearings in the planetary reducer was noisy. It was concluded that this bearing must have been defective upon receipt and not rejected during incoming inspection. This bearing was replaced with a new bearing. Examination of the UHMW polyethylene thread on the drum flanges revealed no wear or yielding. This had always been an area of concern. Figures 3-1 through 3-8 show the various subassemblies and parts of the winch during disassembly.

3.1 TEMPERATURE TESTING.

There had always been concern about the motor's ability to operate under load without overheating, due to its enclosed mounting. To determine the motor's ability, a test[4] was conducted under

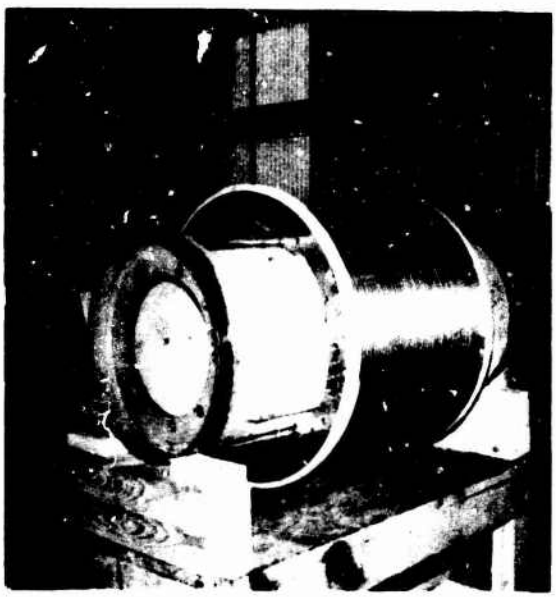


Figure 3-1. Main Shaft With Inner Drum Installed On Recirculating Ball Bearing

Figure 3-2. Cable Termination Ramp, Inner Drum

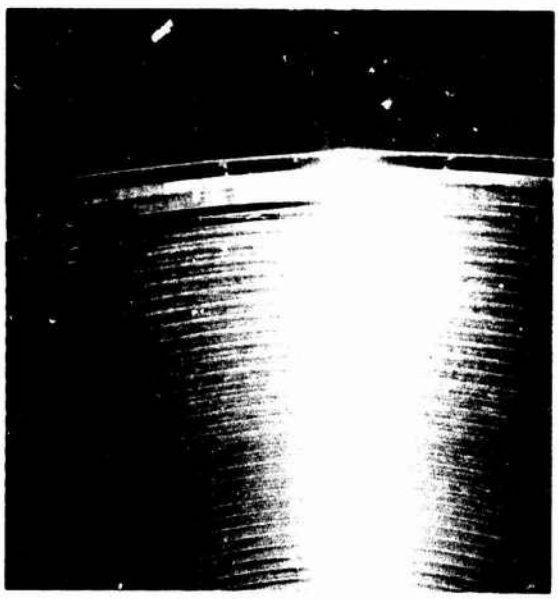


Figure 3-3. Drum Thread and Cable Slot

Figure 3-4. Latch Installed on Drum Flange

Figure 3-5. Drum Latch Disassembled

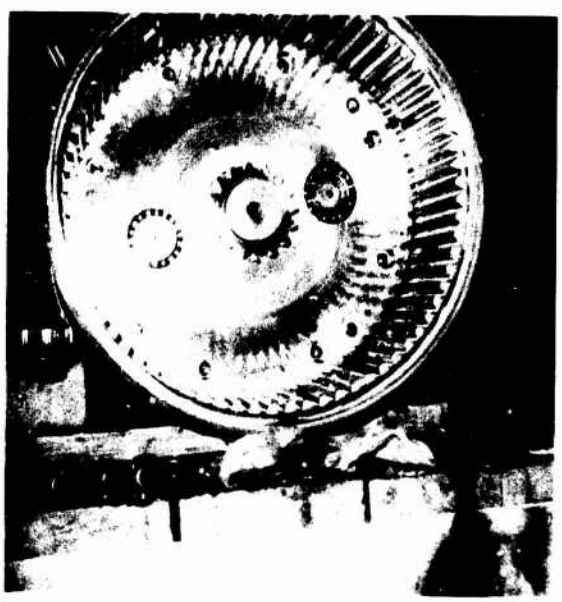


Figure 3-6. Planetary Ring Gear
(Primary Pinion Central)

Figure 3-7. Planetary Gearing (Primary Background, Secondary Foreground)

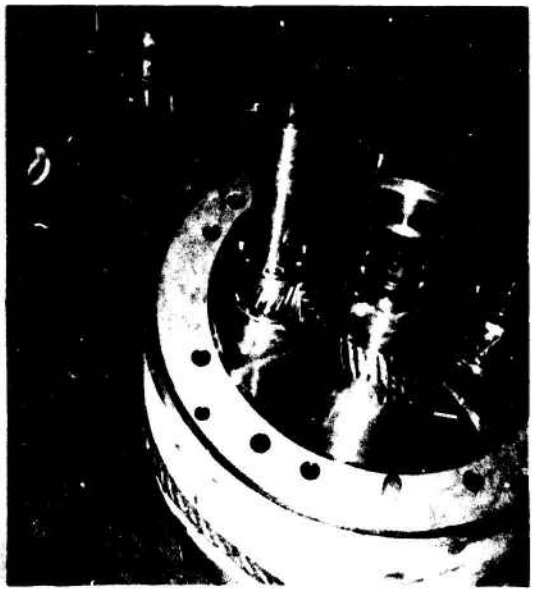


Figure 3-8. First Reduction Gearing (Brake Pinion Shaft Protruding, Motor Pinion Opposite)

simulated operating conditions at its manufacturer's plant. The motor was enclosed in a 20 inch diameter X 38 inch long tube with one end closed, submerged in water and connected to a 100 Hp dynamometer. Care was taken to minimize flow past the motor. The motor was instrumentated to measure voltage, current, and temperature. A complete inhaul and payout cycle at full line tension (5600 lbs) was simulated as follows:

30 HP at 1800 RPM for 2.0 Minutes
13 HP at 900 RPM for 0.5 Minutes
35 HP at 1800 RPM for 2.0 Minutes
15 HP at 900 RPM for 0.5 Minutes
40 HP at 1800 RPM for 2.0 Minutes
17 HP at 900 RPM for 0.5 Minutes
10 HP at 1800 RPM for 6.5 Minutes
4 HP at 900 RPM for 1.5 Minutes

As a result of this test, the motor can adequately perform in 40°C (104°F) stagnant water which exceeds the requirements of its specification.

A second area of concern was the ability of the motor to operate in air under light load. This condition would be experienced during the installation and removal of the towline. A second test[4] was run with a set up similar to the first except without water for a coolant. The motor was loaded to six horsepower and run continuously at half speed (900 rpm). Temperature rise as a function of time was determined. Cool down rate after stopping the motor was also measured.

Based upon this test, the motor can be run in air under light load. However, in high ambient temperature (120°F) the duration must be limited to approximately 13 minutes, which is just sufficient to load the 1000 foot towline at low speed. At lower ambient

temperatures proportionately (100°F, 19 minutes) larger times are allowable. It should be noted that heating the motor up to maximum (175°F) temperature reduces its life since this causes the insulation on its winding to breakdown. Once the motor is heated up, cooldown could take as long as 6 hours in a 65°F ambient temperature. If time is not allowable, external cooling, i.e., fire hose, must be supplied to prevent damage to the motor.

3.2 FUNCTIONAL TESTING.

Upon completion of the motor test at its manufacturer, it was installed in the winch which had been previously modified. To assure proper functioning of the combination, a no load air test was conducted at the winch's manufacturer. During this test, the unit was run through a complete inhaul and payout cycle while monitoring the motor's temperature. The unit functioned satisfactorily during this test, but care had to be taken at all time to prevent overheating. Figure 3-9 shows the motor installation. Appendix A contains the revised winch assembly and inner shaft subassembly drawings and parts list.

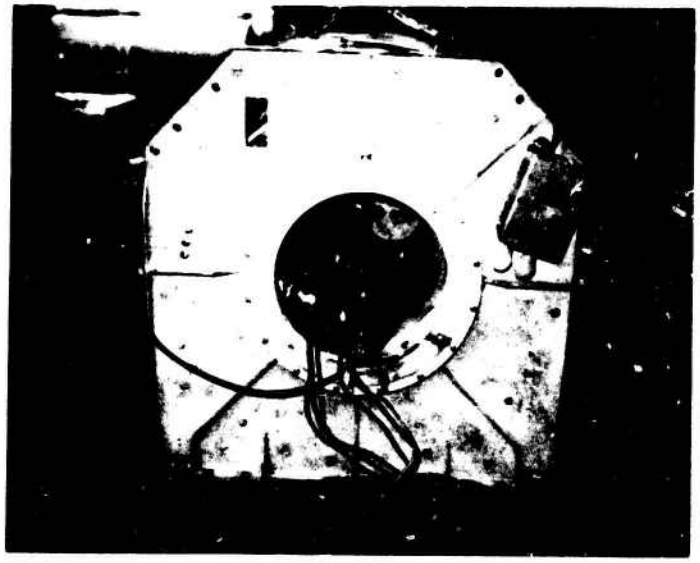


Figure 3-9. Winch With Electric Motor Installed

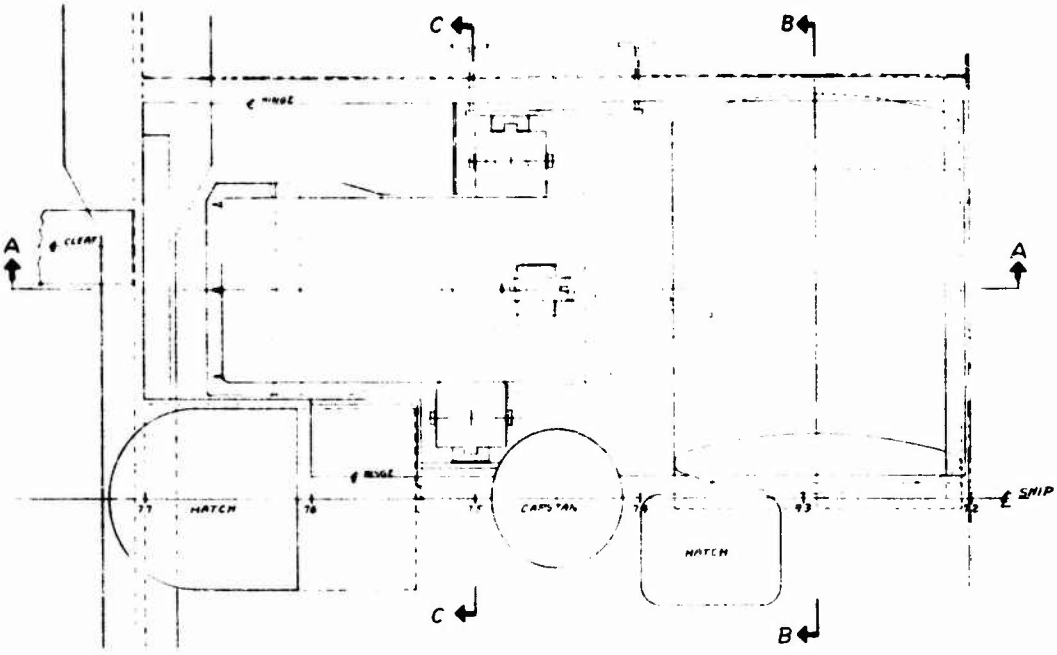
SECTION IV
ANCILLARY EQUIPMENT

The winch had always been perceived as the critical component in developing the improved submarine towed communication system. Once its development had proceeded to the point where the winch's feasibility had been demonstrated through hardware testing, the remaining portion of the system development was initiated.

4.1 PRELIMINARY DESIGN STUDIES.

Certain ancillary equipment is required for the towed buoy launching, retrieval, and towline streaming. Originally the BIAS system aboard the USS POGY (SSN-647) was to be modified to accept a faired cable. This required a special towing sheave, a fairing guide, and a nest. Figure 4-1 shows the preliminary design for the BIAS system ancillary equipment. This design required that the doors be lengthened, the port cleat and life rails be repositioned, and the davit foundation be modified.

Due to difficulties experienced in aligning the buoy lift mechanism rails aboard the POGY, Mare Island Navy Shipyard conceived a palletized approach to the ancillary equipment. This concept incorporated the door, nest, and lift mechanism into one unit. This concept was facilitated by the approval of a special flexible hose for submarine use. It was decided that this concept should be investigated for the SCAT winch ancillary equipment, since it would greatly reduce installation problems.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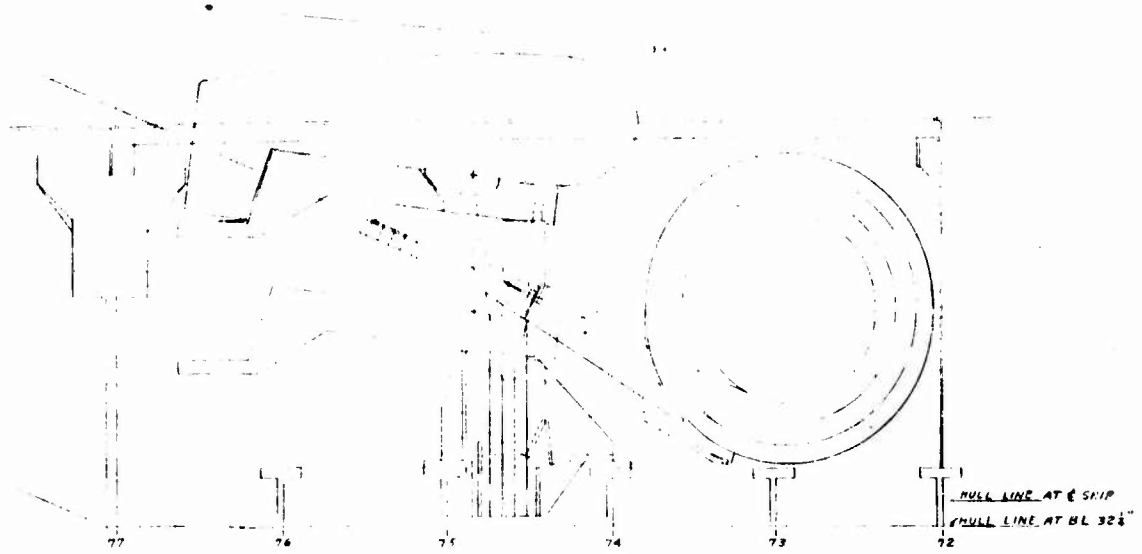
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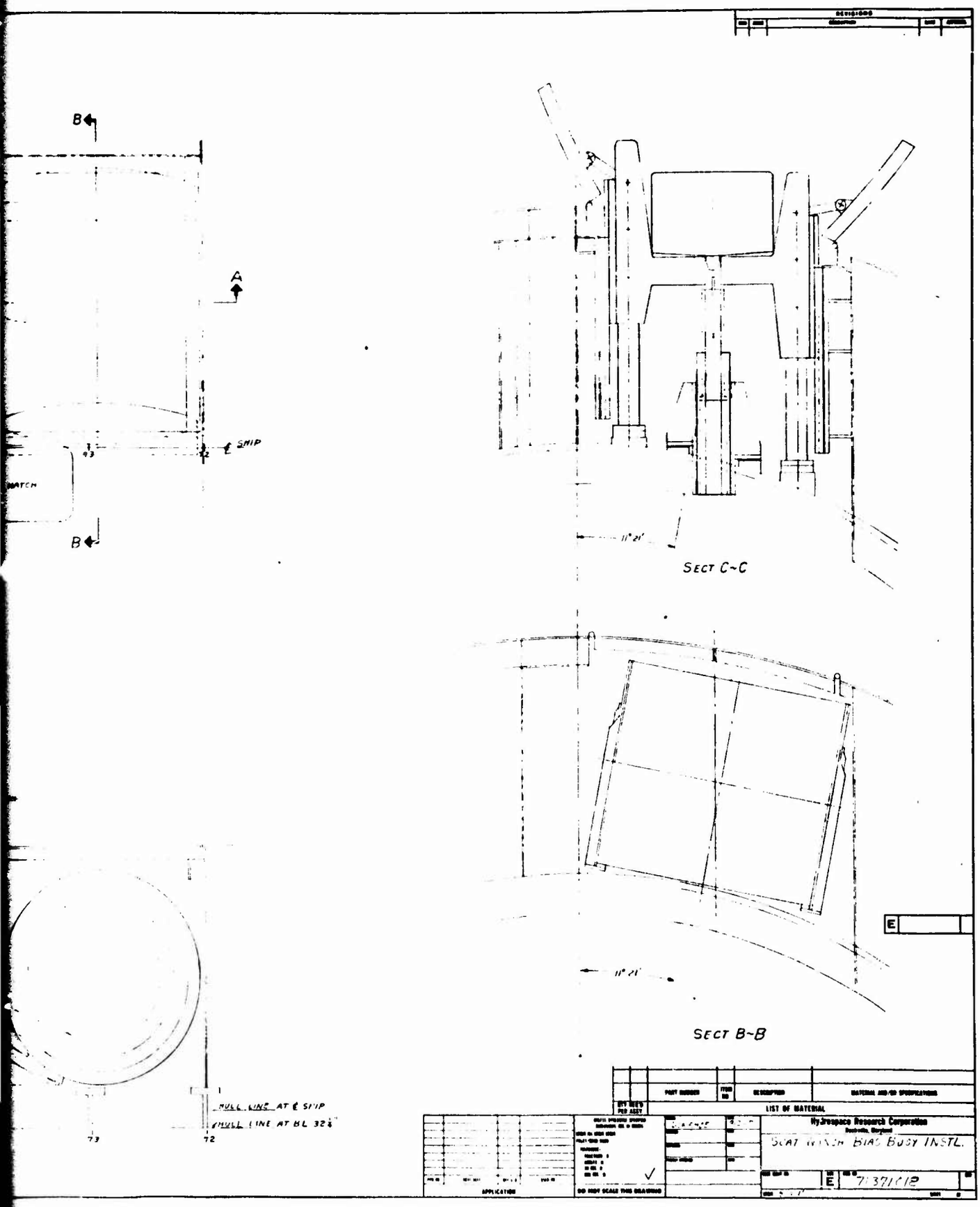


Figure 4-1. SCAT Winch BIAS Buoy Assembly

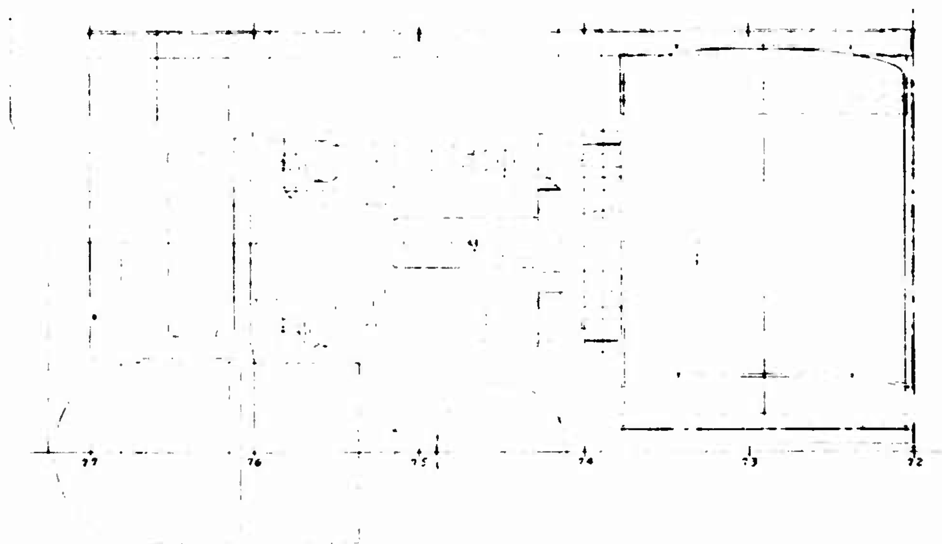
B

A second design study for the SCAT winch ancillary equipment based upon the new guidelines was conducted and Figure 4-2 shows the results. This approach also required the same submarine modifications as the first design.

Throughout the development of these two concepts, the accommodation of slack towline when the nest is lowered was to be accommodated by winch reeling. Further investigations into this aspect revealed that controlling the motor would be very difficult due to its inertia. This would require a brake that would allow almost no coast after actuation. This could be difficult to maintain over a given time period due to wear.

In order to obtain new insight and improvements of the SCAT palletized concept, a contract was awarded to Fathom Oceanology Limited, an experienced company in the design and manufacture of faired cable handling systems. To provide Fathom with information as to the space available for the equipment, Figure 4-3 was developed. References 5 and 6 were produced as a result of this contract. Figure 4-4 shows the Fathom developed concept. The mechanism for raising and lowering the nest is a simple scissor action driven by a pair of hydraulic cylinders. To accommodate the slack cable during raising and lowering the nest, the towing sheave is supported on a linkage. Figures 4-5, 4-6, and 4-7 show the action of this linkage.

The tow "sheave" (roller quadrant) is supported on the free-end of a boom which is pivoted at the lower base of the lift mechanism. The boom is also counterbalanced such that the down force of the boom-head on the tow cable is limited to 200 lbs. A restrainer linkage suitably arranged and connecting the boom-head to the base will limit the maximum height that the boom-head can attain above the base frame regardless of the position of the nest.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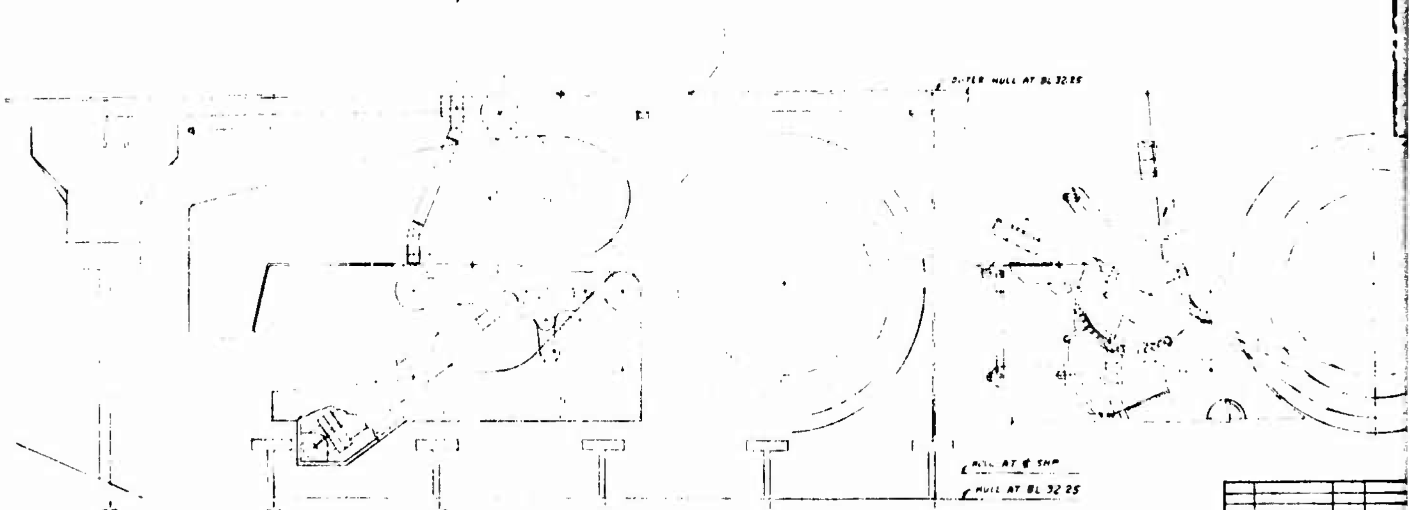
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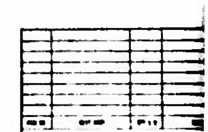
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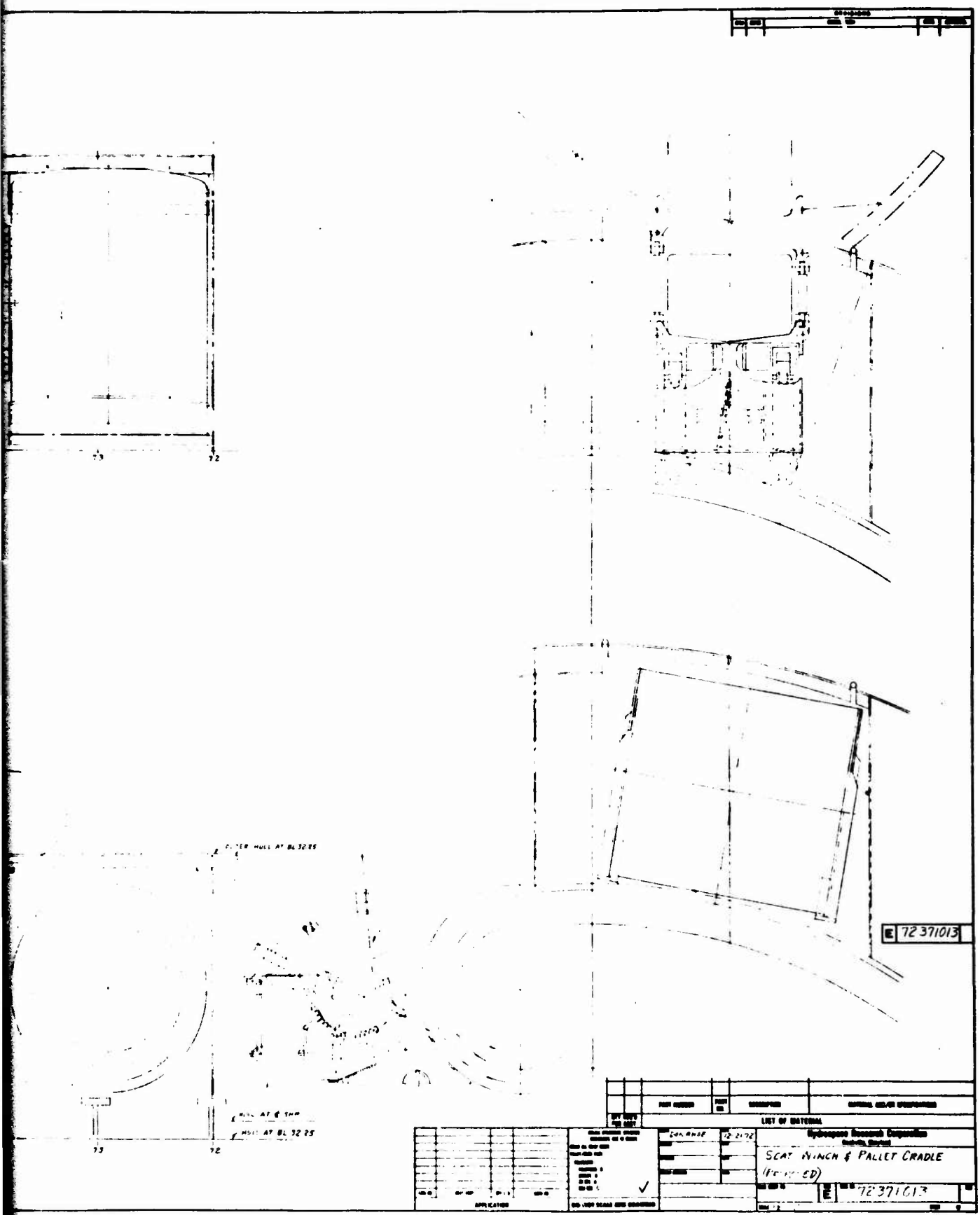
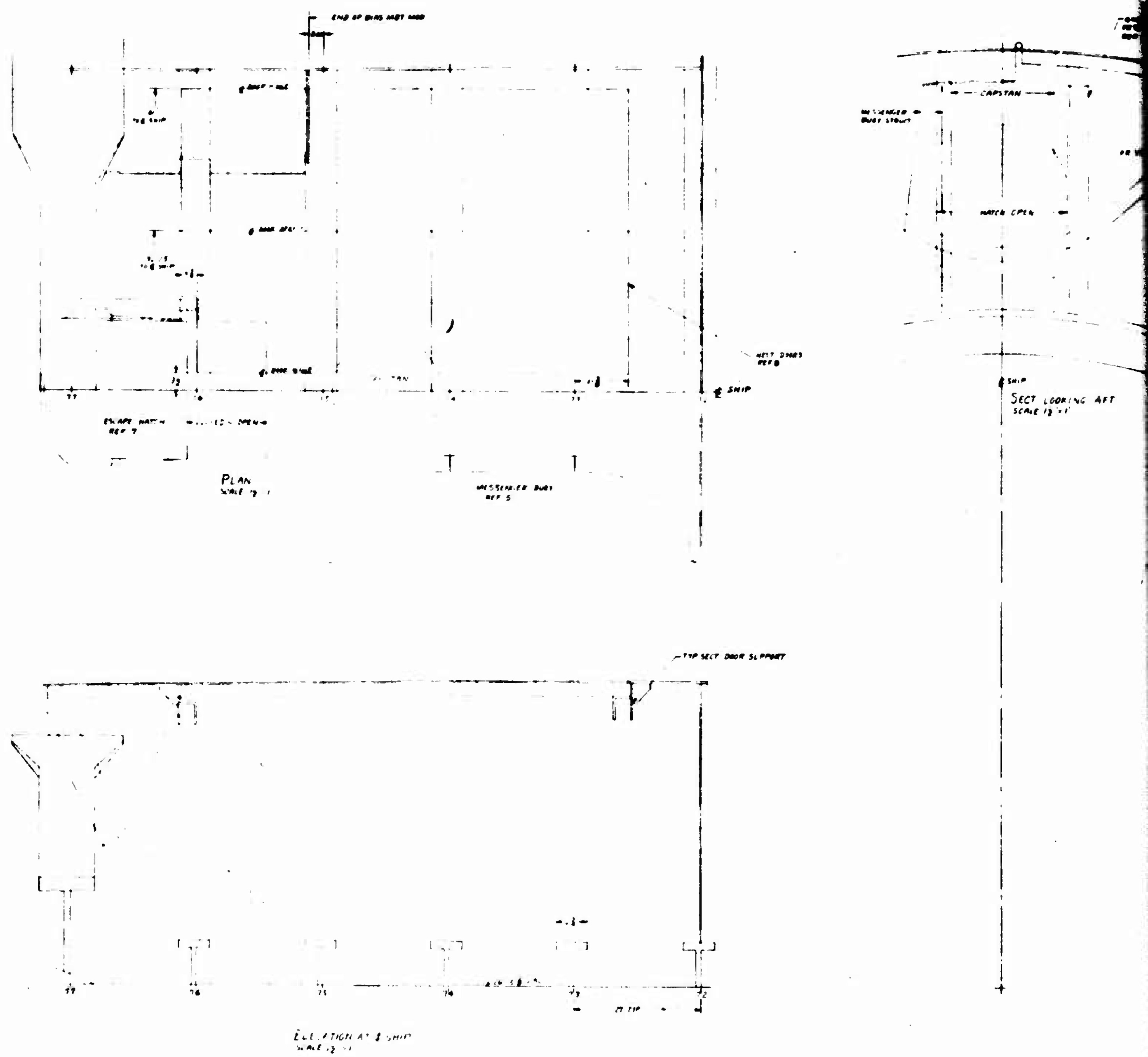


Figure 4-2. Proposed SCAT Winch and Pallet Assembly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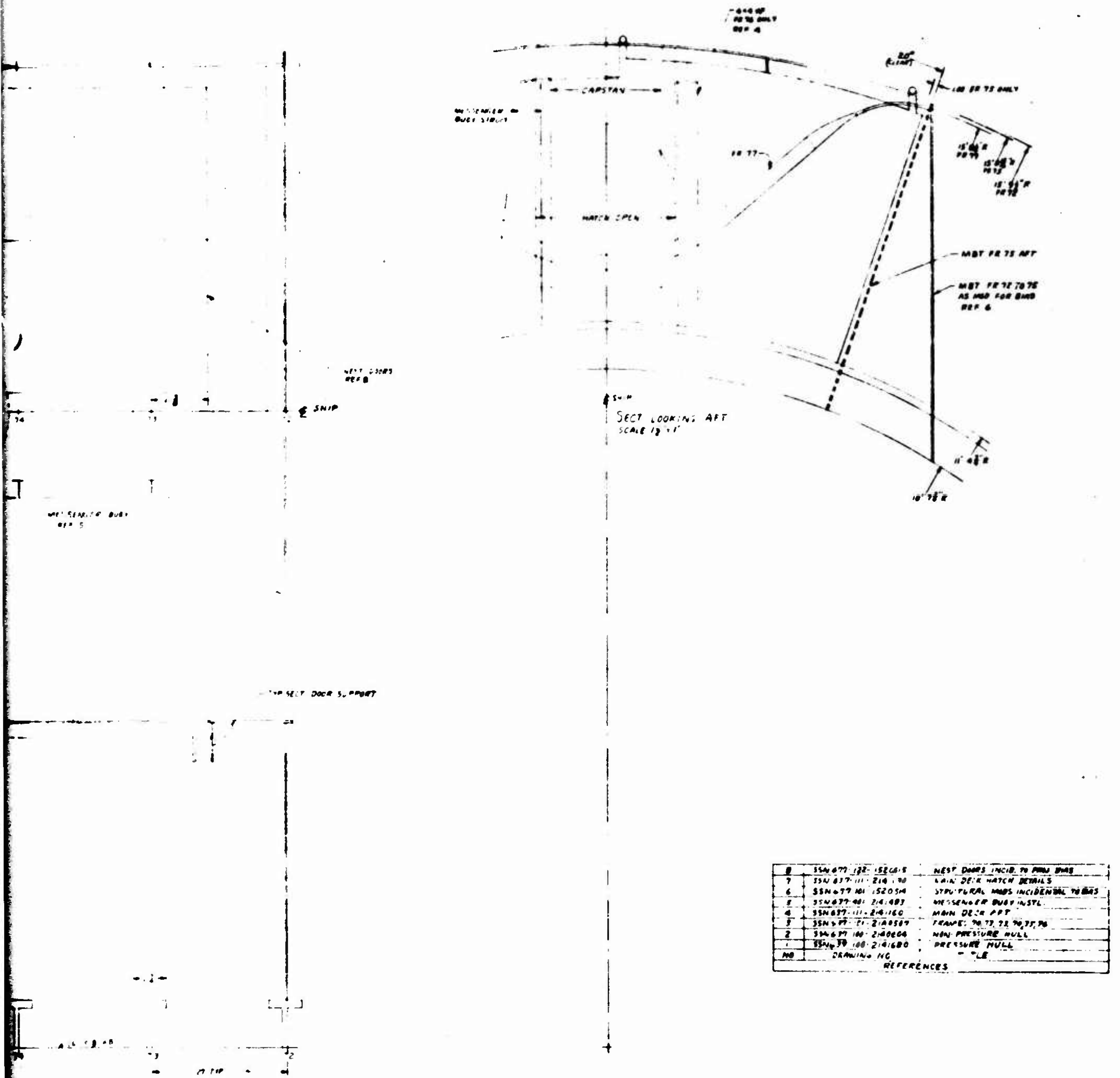
ELEVATION AT ℄ SHIP

A

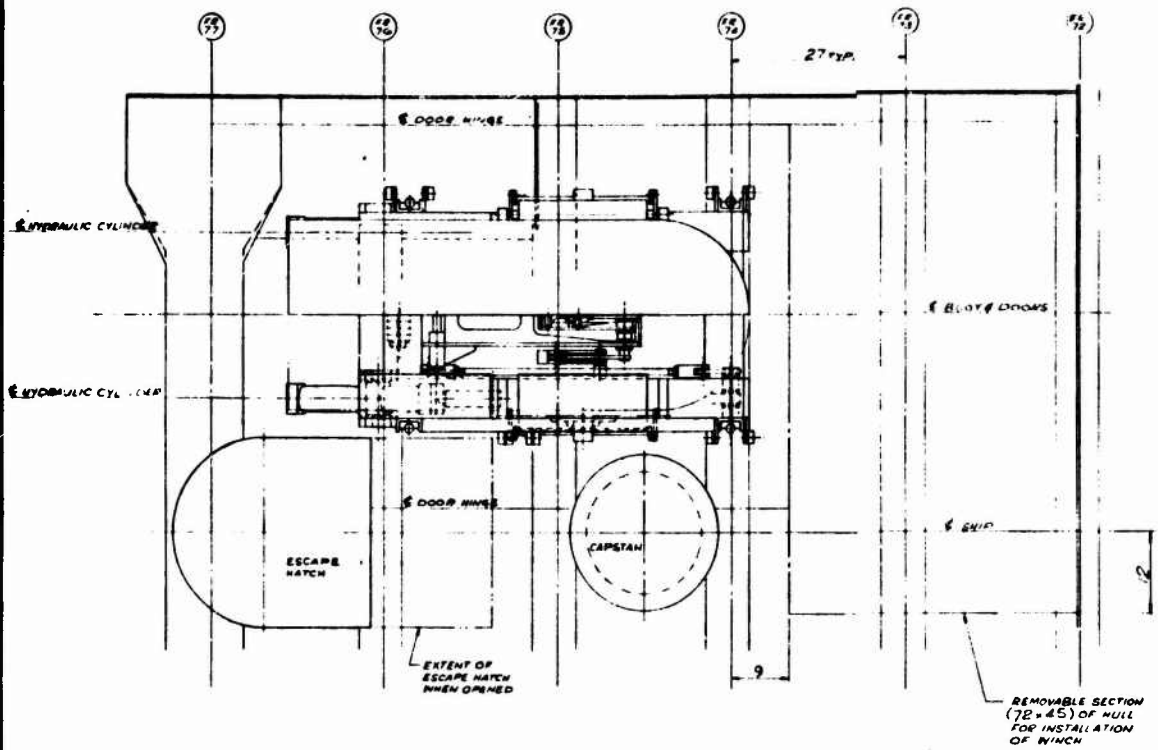


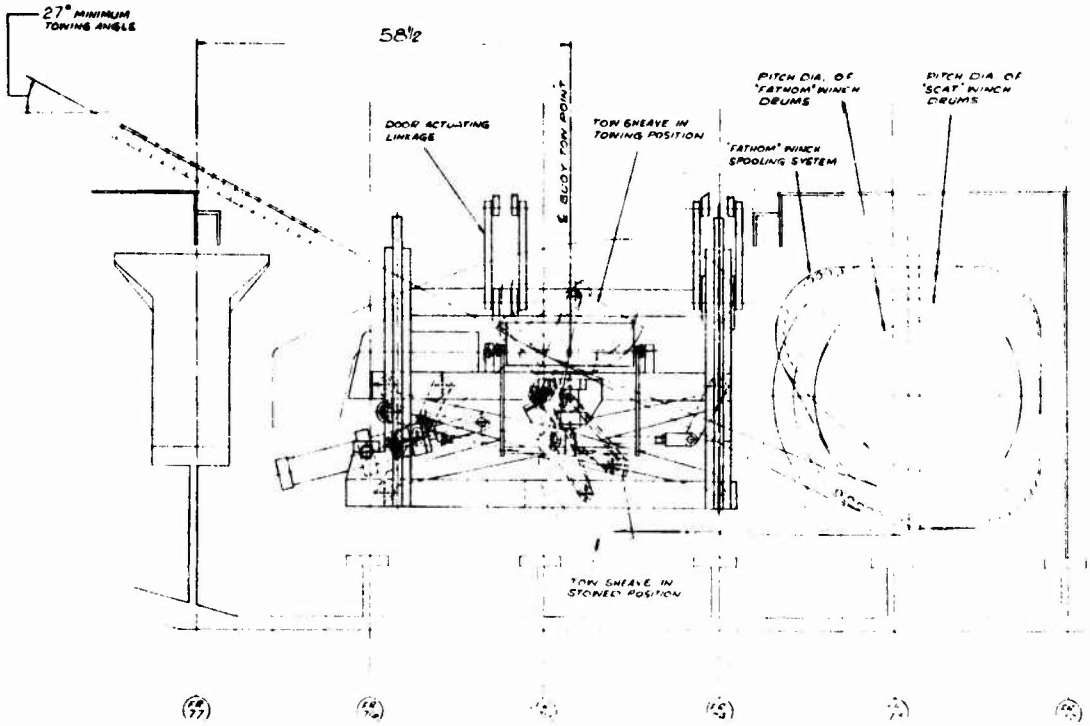
8	SSN 677-122-1526615	NEST DOORS INCID. TO PRM BIAS
7	SSN 677-111-214170	MAIN DECK HATCH DETAILS
6	SSN 677-101-1520514	STRUCTURAL MODS INCIDENTAL TO BIAS
5	SSN 677-401-2141483	MESSENGER BUOY INSTL
4	SSN 677-111-2141160	MAIN DECK ARR
3	SSN 677-121-2140567	FRAMES 70, 72, 73, 74, 75, 76
2	SSN 677-100-2140664	NON-PRESSURE HULL
1	SSN 677-100-2141680	PRESSURE HULL
NO	DRAWING NO	TITLE
REFERENCES		

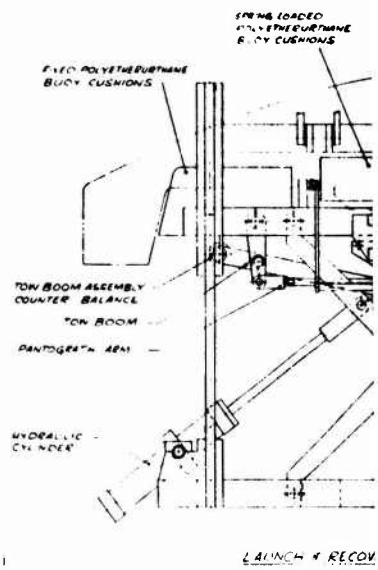
LAYOUT BIAS BUOY CAVITY
72371812 12-18-72

B

Figure 4-3. BIAS Buoy Cavity Layout







LAUNCH & RECOV

SECTION (A-A)

STOWED TOWING POSITION

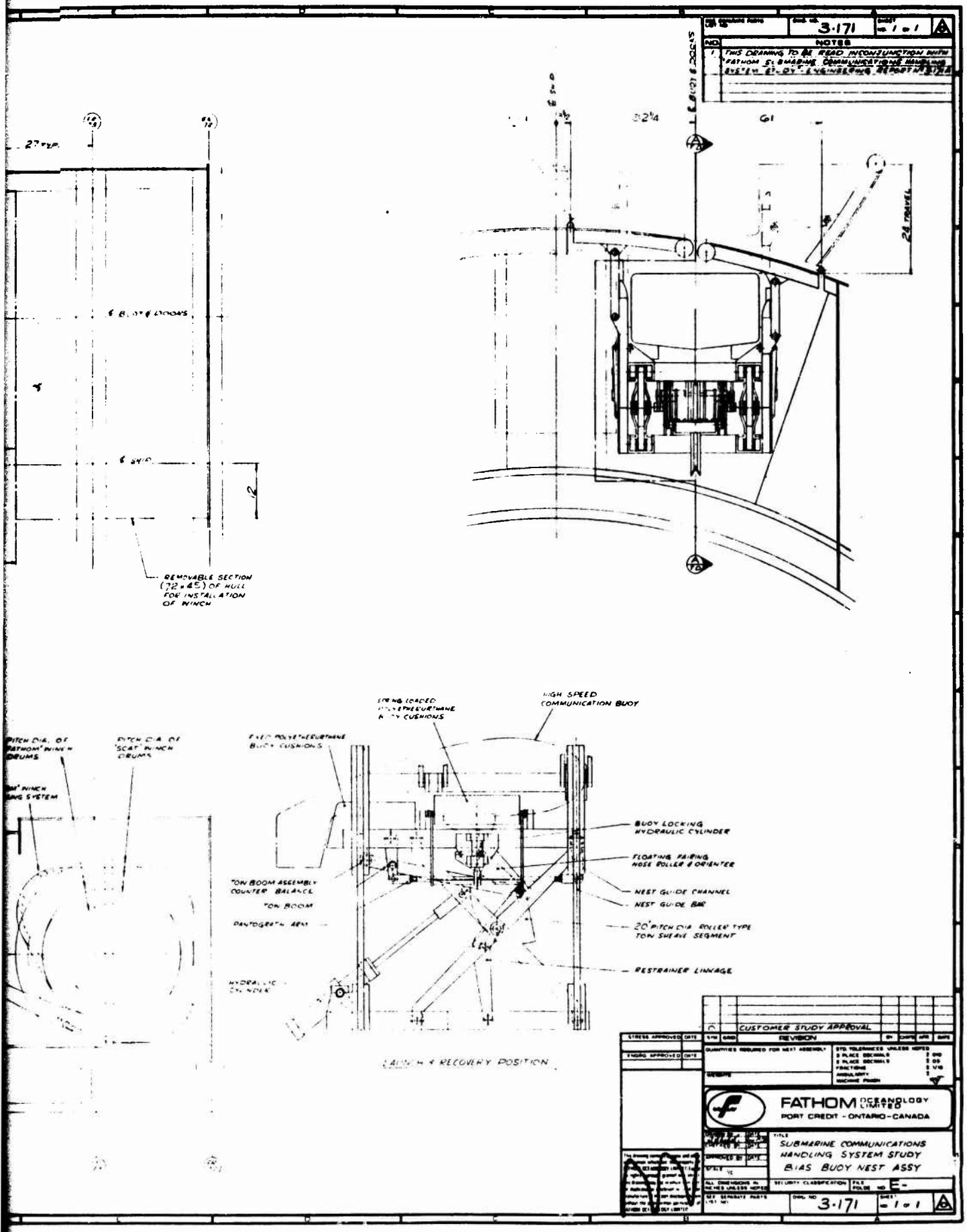


Figure 4-4. BIAS Buoy Nest Assembly

B

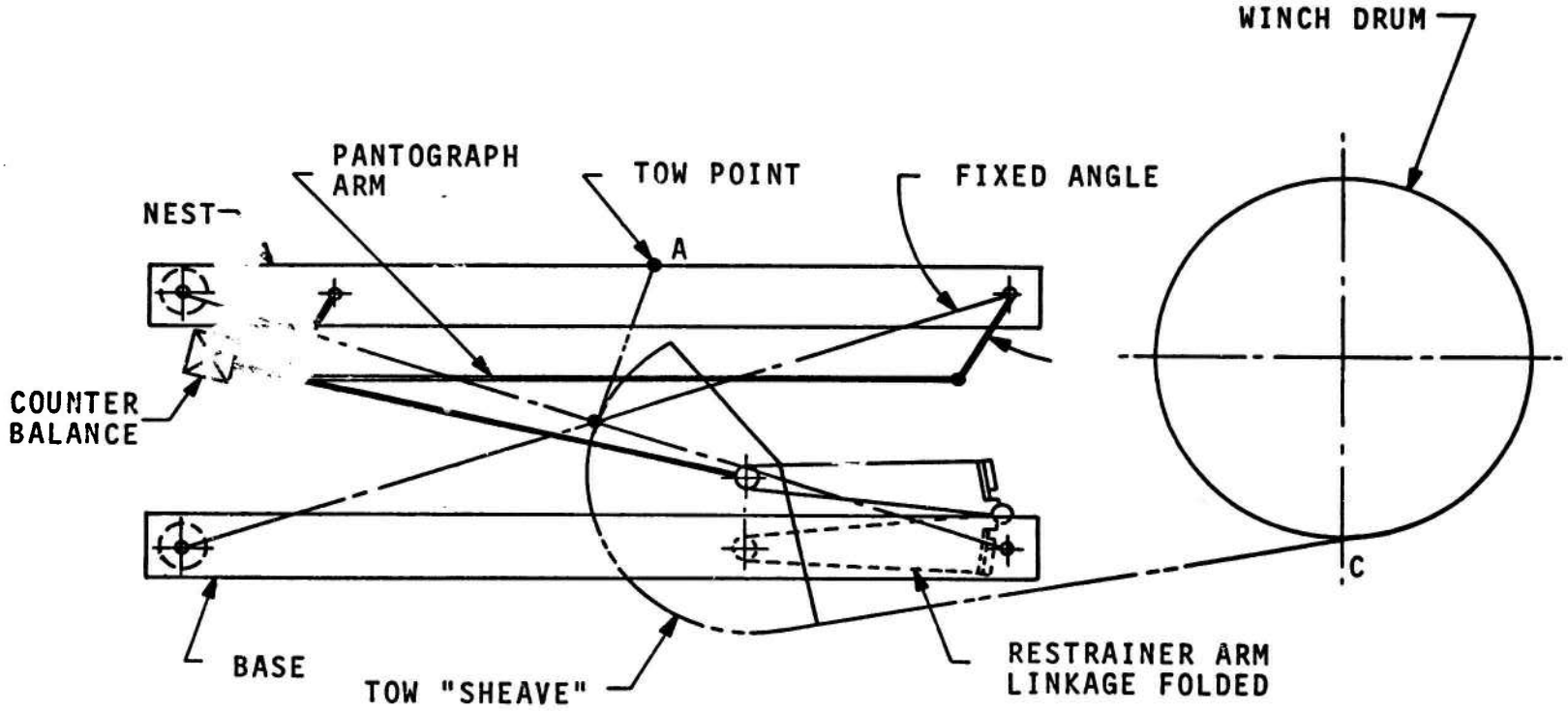


Figure 4-5. Stowed Position

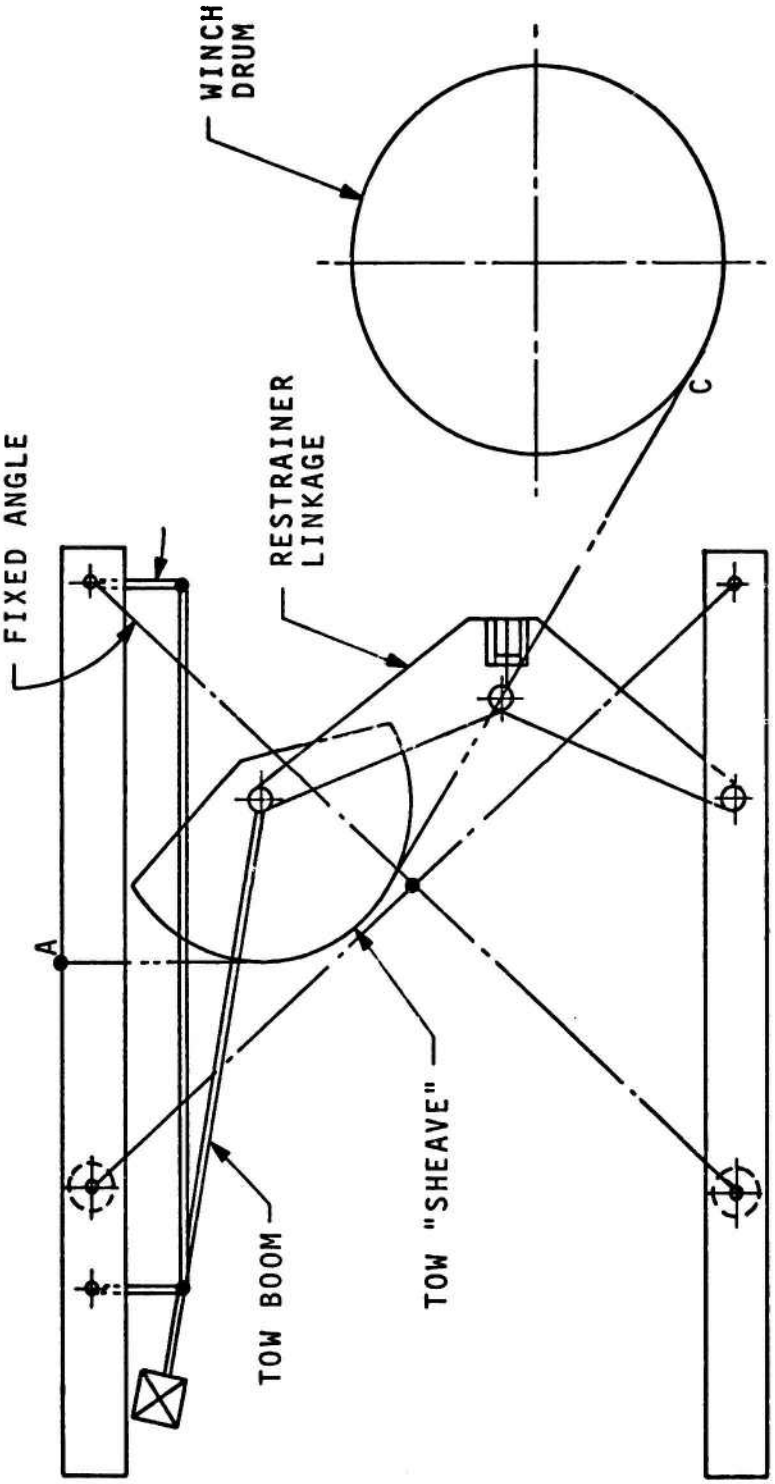


Figure 4-6. Launch and Recovery Position

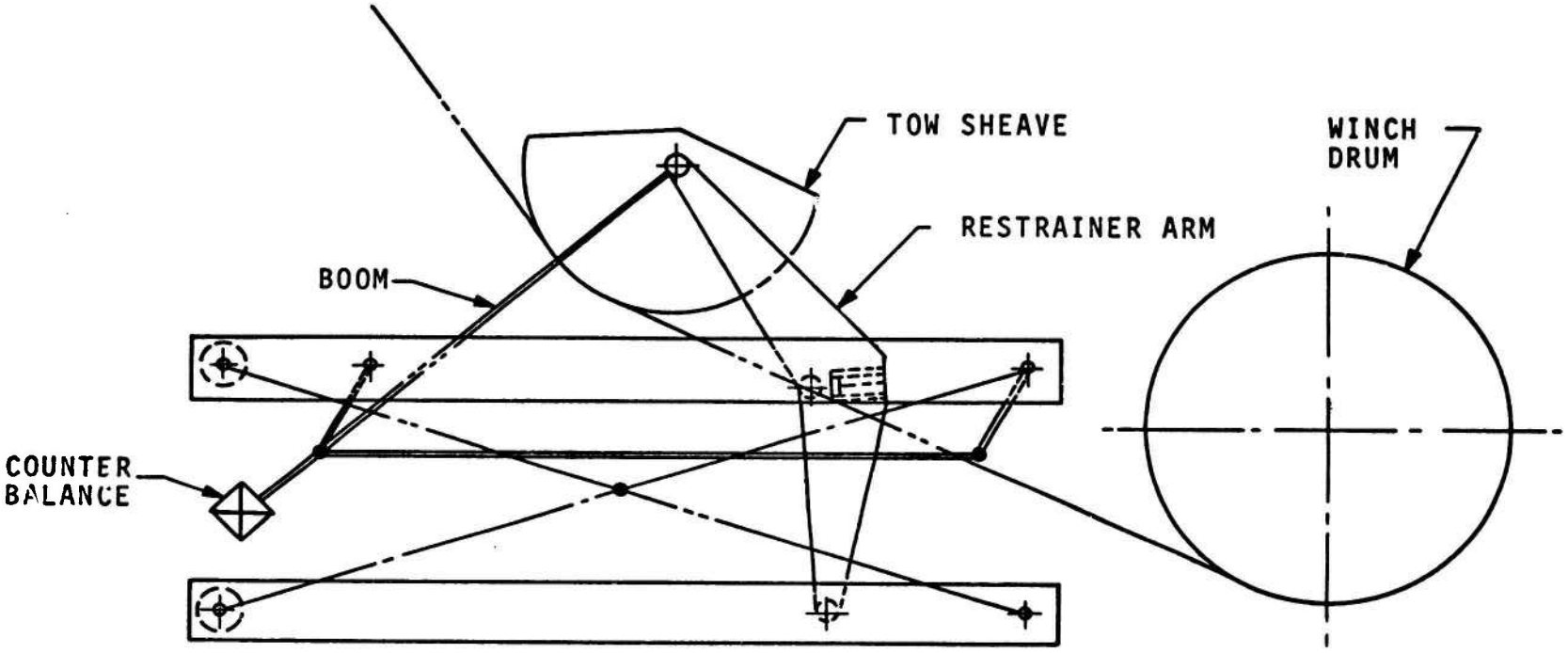


Figure 4-7. Tow Position

When towing, tow cable tension will lift the boom-head to its limit, at a position above the nest (the nest being in the down position during towing). Prior to a recovery, the boom-head will be at its high position. The nest will be raised but the boom-head will remain stationary due to its restrainer cable or stop and will thus, be below the nest once the nest reaches its fully extended position. Once the buoy is in the nest it will automatically be locked to the nest (Figure 4-9) with a specific cable length between points A and C (Figure 4-5). As the nest is lowered, the boom-head will descend with the nest maintaining contact with the tow cable and, due to its weight (adjustable by the counterbalance), will maintain a small stowage tension in the tow cable. In effect, once the buoy is locked in the nest the boom-head acts like an "idler sprocket" to prevent slack cable. To prevent the boom-head from falling too low in the stowed position, a pantograph linkage moves the boom pivot aft as the nest is lowered. It can be shown that this arrangement allows the boom-head to find its own position and that this configuration is applicable to the SCAT winch geometry or other winch geometries.

Figure 4-8 shows the boom-head including the broken-fairing orientor. The mechanism is pivoted about the center of the boom-head and rests on the leading edge of the tow cable via a roller. Thus, as the cable tow angle changes, it remains in alignment with the incoming cable.

Previous communication buoy handling systems such as the BIAS and BRA-27, provided a torsional spring arrangement within the winch drum such that when the buoy contacted the nest and commanded the motor to stop, deceleration of the winch drive was absorbed by these springs. In the case of the SCAT winch, no such "shock absorber" could be provided since the drive unit is located within the drum assembly using up the space previously occupied by these springs. Therefore, compliance was provided at the nest/buoy interface.

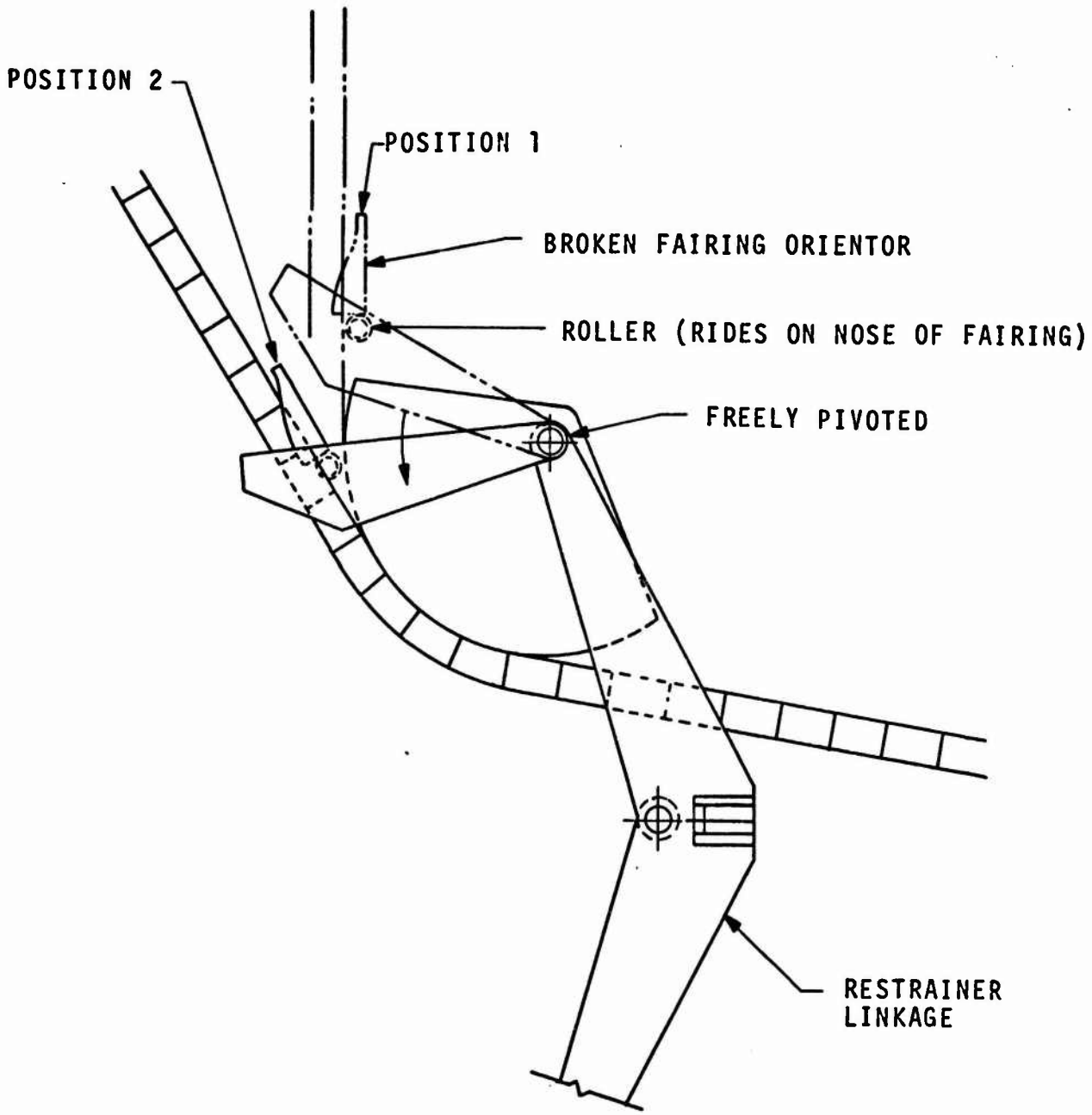


Figure 4-8. Boom-Head Detail Showing Broken-Fairing Orientor

Figure 4-9 shows schematically an arrangement in which 'L' shaped cushions are torsionally spring biased via Neidhart torsional springs. A sensor limit switch is provided to sense the arrival of the buoy. Adjustment of this switch will account for the deceleration time of the winch after the power has been cut.

To prevent the buoy from floating off the nest during lowering and raising, a hydraulicly released latch was incorporated into the nest cushions. By adding a longitudinal strip, i.e., bilge keel to the buoy and configuring the nest cushion to accommodate, the buoy is secure thus, alleviating the slack cable tension condition. These cylinders are a part of a sequence circuit used with the cylinders that raise and lower the nest to alleviate additional operator action.

The doors are linked to the nest so that the doors and nest operate in unison. The nest is raised by a scissor mechanism. Additional stability is provided to this mechanism by four guide bars extending upward from the base member. The nest has four channel uprights that slide on the guide bars via polyurethane slide members. The guide bars connect to the pallet from members that also carry the door hinges. The door linkages pivot on the channel upright members.

Figures 4-10 through 4-13 show several views of a 1/8 scale model of the POGY cavity with and without the SCAT winch and the ancillary equipment installed.

4.2 DETAIL DESIGN.

Recent developments in cable fairing suitable for the submarine communication mission presented another candidate winch approach. This approach is similar to SCAT except that the drums do not fleet. Fathom Oceanology Limited had reduced this concept to

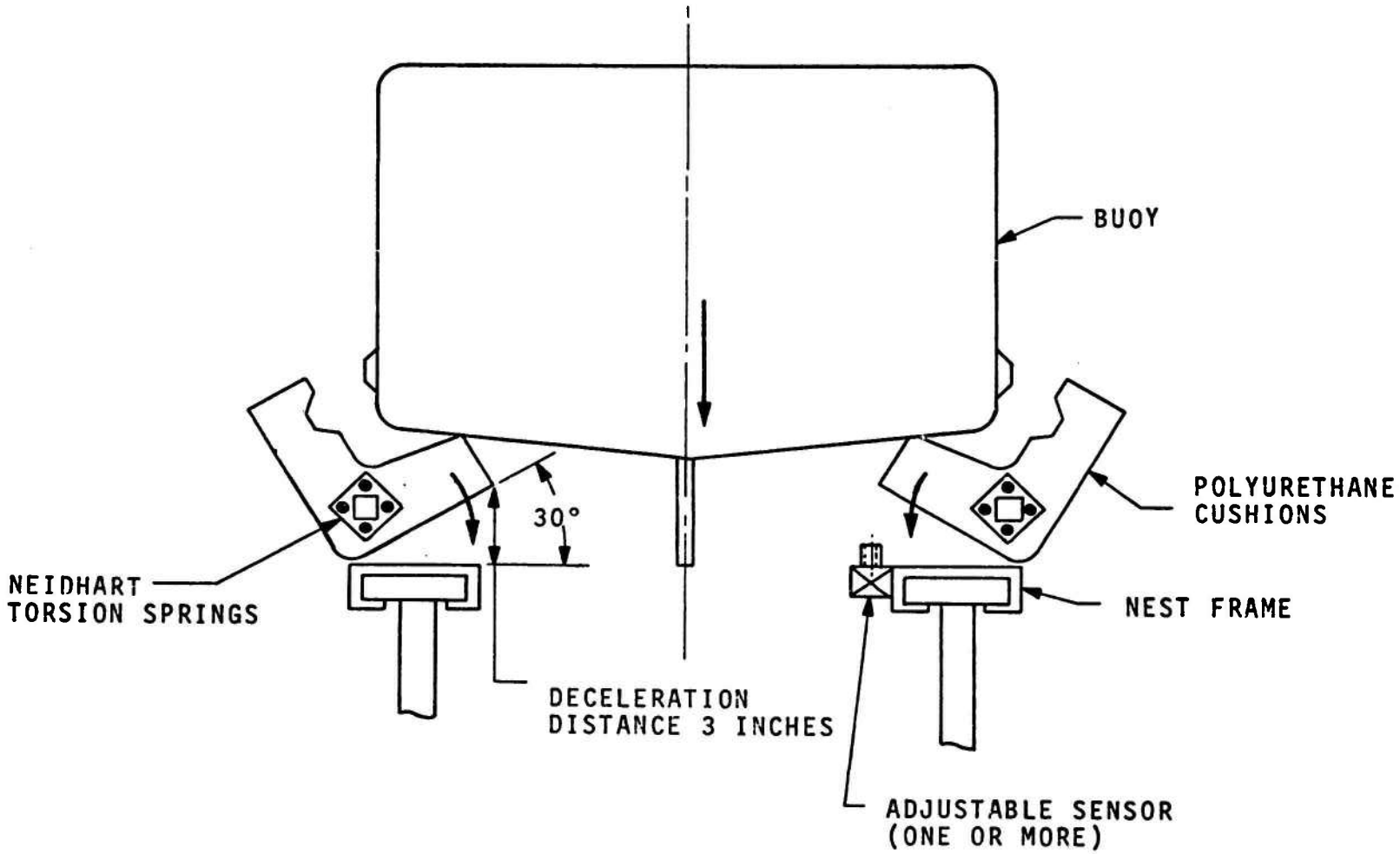


Figure 4-9. Schematic Arrangement of Nest Incorporating Shock Absorber Pads

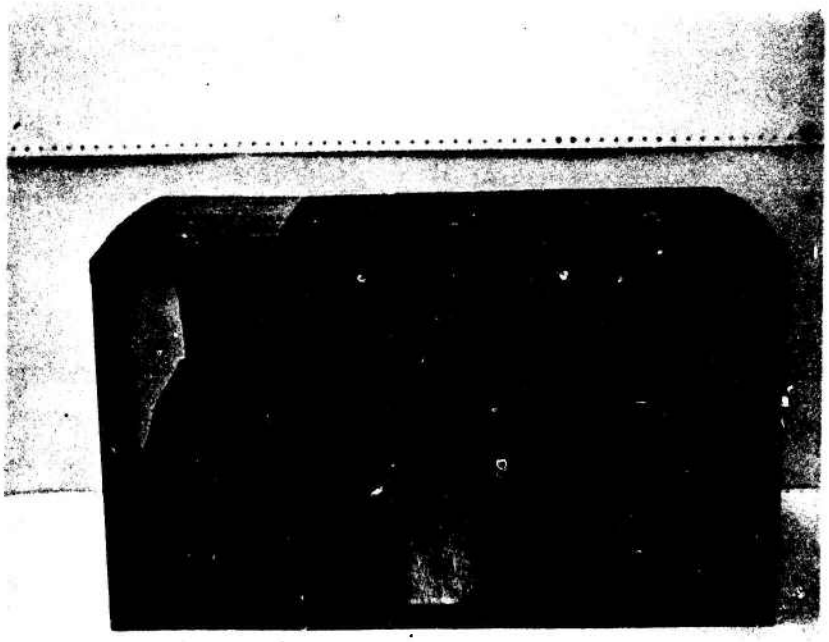


Figure 4-10. Model of USS POGY Cavity

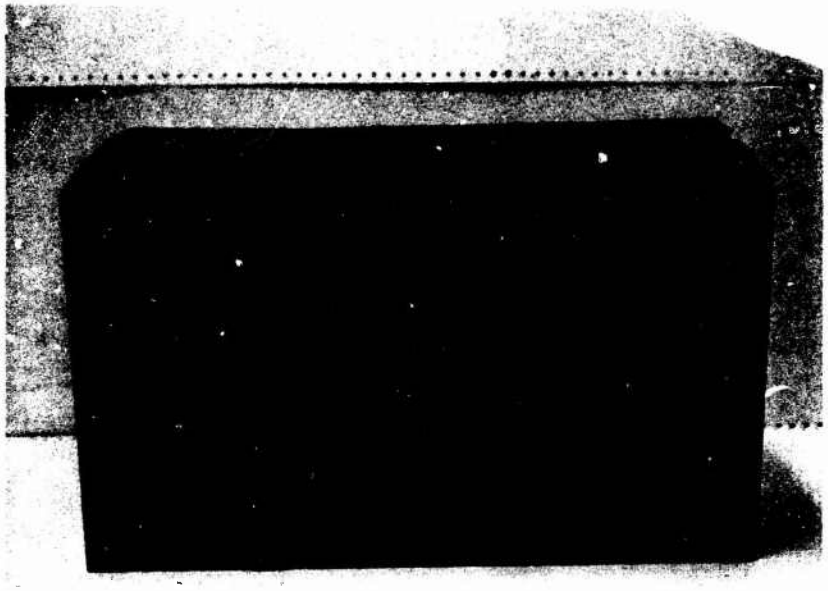


Figure 4-11. Ancillary Equipment and SCAT Winch Installed in Cavity

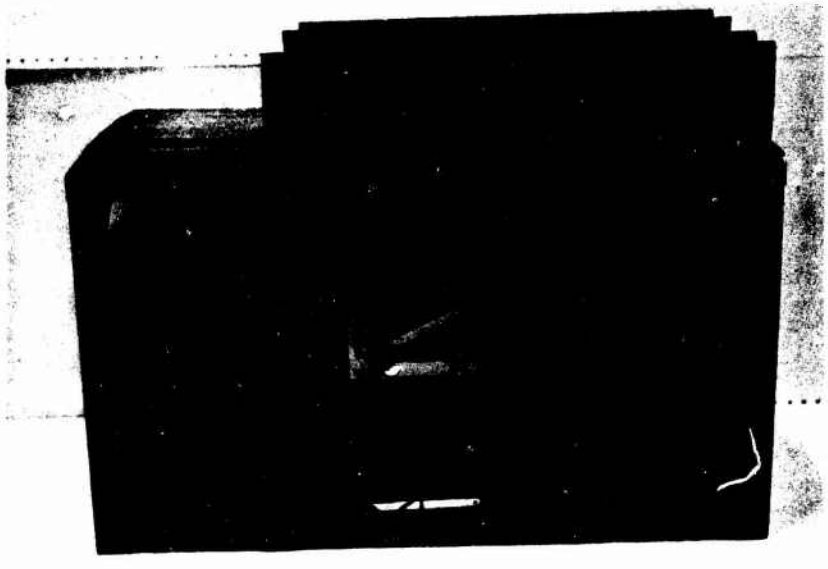


Figure 4-12. Ancillary Equipment and SCAT Winch (Doors Open and Nest Raised)

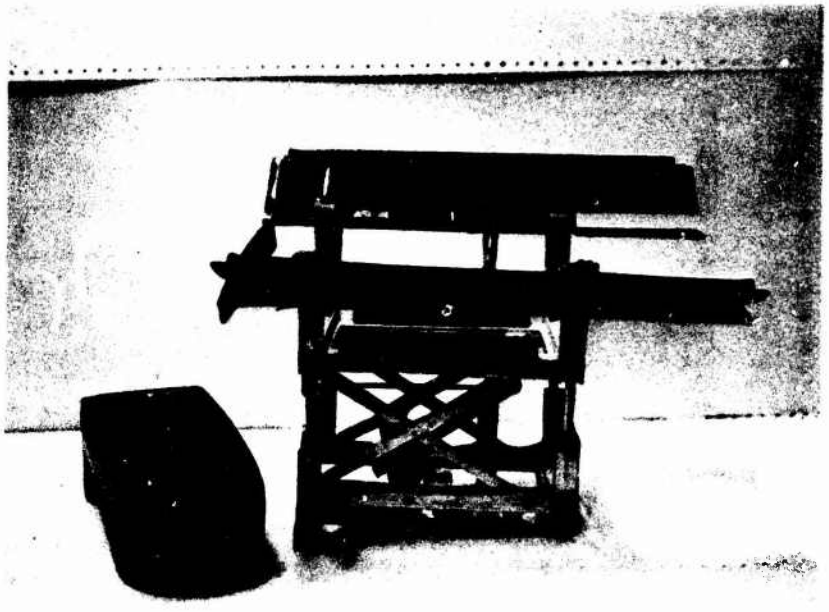


Figure 4-13. Palletized Ancillary Equipment Model (Doors Open, Nest Raised, and BIAS Buoy to Left)

hardware for several surface ship applications. Due to the nature of the submarine communications mission, an alternate winch development in parallel with the SCAT winch was undertaken. To prevent duplication, as many common components as possible were used with each winch. It was decided that the drive developed for SCAT and the ancillary equipment discussed previously should be utilized.

As a deliverable of the preliminary design study conducted by Fathom Oceanology Limited, and discussed in the preceding section, a cost estimate to design and fabricate the ancillary equipment, and a suitably configured multi-drum winch of their patented design, was provided. The cost estimate was based upon fabricating the equipment from both aluminum and stainless steel suitable for sea water submergence. Since the estimates were higher than anticipated, alternatives were sought and recosting, based on fabricating the equipment from steel with electroless nickel plate for corrosion protection, was undertaken.

A request for proposal (Appendix B) for the ancillary equipment was prepared and submitted to two potential sources. One source declined to bid due to the required documentation, and the other source was unwilling to accomplish the work under a fixed price contract. The second source indicated that they would consider taking the job under a cost plus type contract for approximately $250,000. Since the type of contract and the high price were not in keeping with the program plan, the alternate source approach was not pursued any further.

By changing the material to steel with electroless nickel plate, the cost of the equipments was reduced so that the program could continue. A contract (Appendix C) was awarded Fathom Oceanology Limited to design the ancillary equipment and an alternate winch of their patented design suitable for the size and scope of the faired cables under consideration. Appendix D contains the

installation, general arrangement assembly, and special subassembly drawings of the ancillary equipment and alternate winch that resulted from the contract. The parts list for the ancillary equipment and the winch is also included.

Drawing 3.207-1, Sheet 1 of Appendix D shows the installation of the ancillary equipment and both winches i.e., SCAT and alternate (Fathom) in the POGY SSN 647 cavity. Mounting pad requirements, installation geometry, clearances, and some special installation instruction are identified.

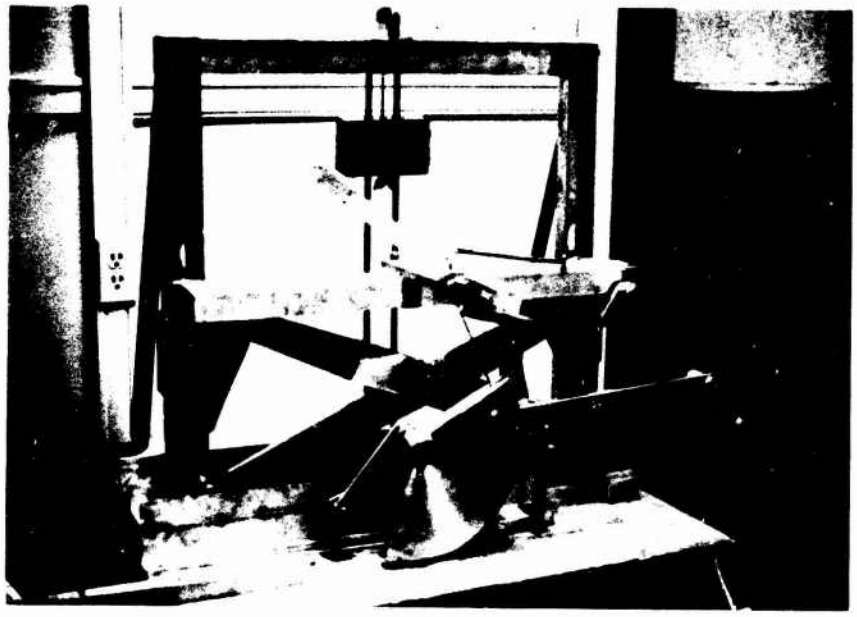
Sheet 2 shows the doors and winch patch installation geometry and mounting pad requirements. The winch is attached to its patch prior to installation and then lowered on to tapered pins installed in the cavity (Section at FR72 Sheet 1). The patch is then bolted to the submarine as shown in Section B.

Drawing 3.207-2, Sheet 1 shows a side view of the alternate winch and ancillary equipment. Sheets 2 and 3 are plan and end views of this equipment. Sheet 4 is a hydraulic schematic of the ancillary equipment.

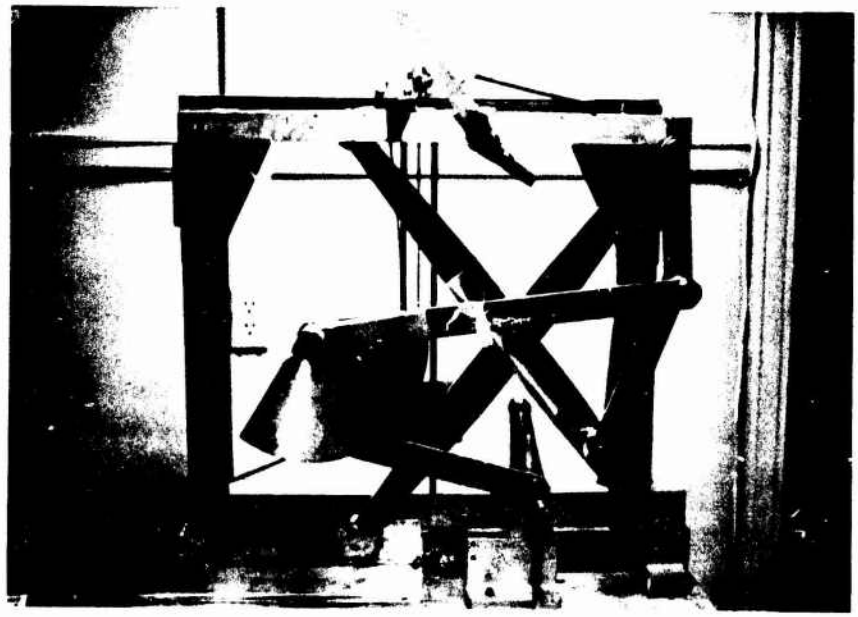
Drawing 14D, Sheet 1 of Appendix D is a side view of the nest assembly in the stowed position. The unit is functionally similar to that described previously. However, several simplifications and improvements have been incorporated. The scissor action for raising and lowering the nest hydraulic cylinders has been repositioned inline with the door hinge and attached to the nest instead of the aft scissor arms. With this arrangement the door loading is no longer carried through the scissor action. Also, the mechanical advantage of the lift is improved which allows smaller cylinders.

By judicious selection of linkage geometry, pivot placement, and the incorporation of an adjustment the towing sheave linkage has been simplified. Part 48 on Drawing 14D is an adjustable eccentric pin which is positioned so that there is no change in cable length when the nest is raised or lowered. This also allows for the variations in cable entry geometry for both the SCAT and the alternate winch. In order to verify the linkage arrangement, a half scale model of one side of the nest assembly was constructed. Figure 4-14 shows the model with the nest in the stowed and raised (launch and recovery) positions. A small cable was attached to the nest simulating the buoy towpoint in the recovery position, routed around the towing sheave and terminated at the model's base simulating the cable exit position from the winch. The nest was lowered to the stowed position and the cable was observed for slack. No slack was observed and a towline tension was maintained throughout the raising and lowering of the nest.

Sheet 2 of Drawing 14D shows a section looking aft through the nest assembly in the stowed position. The buoy is shown locked in place. The doors (Part 61) and their connecting linkage and the nest lock-down mechanism (Zone C-4) are also shown. Drawing 14D-61 shows the door assembly. In order to prevent interference with the tapered portion of Frame 76 during recovery, a mechanism was incorporated in the nest to move the buoy forward as the last few feet of cable are inhauled. Drawing 14D-59 shows this mechanism. Two hooks are added to the underside of the buoy which the roller engages. The mechanism imposes a forward force to counteract hydrodynamic drag on the buoy thus, positioning the buoy forward sufficiently to clear Frame 76. As the nest is lowered, the pad on the bottom of the roller link contacts a fixed roller which cams the mechanism out of the way, and eliminates interference with the cable during towing. The action of this mechanism is shown in Figure 4-14. Drawing 14D Sheet 2 shows the buoy hooks capturing the roller.



a. Stored Position



b. Launch and Recovery Position

Figure 4-14. Nest Assembly Model

Drawing 14D, Sheet 3 shows a plan view of the nest assembly. In Zone G-4, the buoy touch-down roller and switch are shown. Sheet 4 shows the nest assembly in a raised (launch or recovery) position. Sheet 5 shows the geometry of the nest mechanism pivots, sheave positions, and the centerline location of the two winches. Sheets 6 and 7 show elevation and plan views respectively of the hydraulic assembly for the nest assembly.

Drawing 14D-35 shows the towing sheave assembly with its spring loaded fairing orientor with integral cable cutter (Section C).

Drawing 6H, sheet 1 shows four views of the alternate winch assembly including the patch. In Zone D-3, an athwartship view looking aft shows the towline fleeting arrangement. The towline runs under the drum through the pivoted lower sheave to an upper pivoted sheave and a fixed sheave and on to the drum. The upper sheaves are driven by a pair of diamond screws. The screws are driven through gearing off the main drum drive. View B, a plan view of the winch assembly, shows the upper guide sheaves and level wind screws and gearing. View A shows the termination of the cable to the drum (dotted lines) and its run to the slip ring assembly (not shown).

Sheet 2 is a cross section view showing the nested arrangement of the grooved drums. The inner drum is mounted on urethane covered rollers supported by the end frames. The outer drum rides on similar rollers supported by the outer drum running in a race on the flange of the inner drum. Sheet 2 also shows the level wind screw and gearing. Item 500 is the SCAT drive including the gear box which is fixed to the left frame of the winch. The drive output is bolted to the inner drum by item 504, and 505 on the right of the drawing.

Sheet 3, a cross section through the drum, shows the towline running through all the guides and around both drums. The end of the towline is attached to the inner drum. The outer drum is positioned so that the slot allows the towline to be wound on the inner drum. On the last wrap of the inner drum the towline actuates a mechanical latch which, at the proper time, affixes the inner drum to the outer drum so that they turn together. The towline is guided over a specially contoured lip at the slot on the outer drum. The outer drum is then filled by fleeting the towline to the other side of the drum. With each revolution of the drum combination the slot is bridged by the towline. The slot is reinforced to accommodate the impressed load and configured to position the towline without undue stress being applied. Item 10 is the first guide from the nest assembly. Incorporated into the lower forward guide is a cable tension sensor. Tension is measured by the change in resistance of a strain gauged bolt like device. Since no change in towline angle of wrap around the guide can take place, accurate measurements of tension can be obtained. Section H shows the holes for routing the cable to the slip ring.

Some areas of the design are suspect. Extensive analyses were conducted on the urethane covered rollers in both the winch and nest assemblies. Due to the nature of the urethane, some doubt still exists as to the rollers ability tc withstand loading without flatting. Testing on the rollers will be conducted by the manufacturer during the next phase of the program.

The second area of concern in the design is the ability of the fairing to withstand the loading imposed by the door rollers during a turn. Fathom has indicated that their Flexnose fairing can withstand this loading without permanent deformation.

SECTION V
CONCLUSIONS AND RECOMMENDATIONS

From the results of the land-based tests, it can be concluded that the SCAT winch guidance techniques are adequate once the faired cable is properly oriented in its grooving. Testing of the submersible electric motor in air and submerged revealed that coolant should be used if more than one inhaul or payout is required in high ambient temperature. The motor and winch functioned satisfactorily as a combination under no load.

In order to provide an entire system, it is recommended that the ancillary equipment be manufactured in addition to the special pancake type slip ring, the fairing guide for entry to the SCAT winch, and the tension measuring guide for the SCAT winch. The new components must also be integrated into the BIAS control system. Once this equipment is assembled, complete system testing must be conducted on land and at sea.

SECTION VI
REFERENCES

1. Bonde, Leslie, "A Compact Submersible Winch for a Faired Towline", Hydrospace-Challenger, Inc. Technical Report No. 4371-0001, June 1973

2. NSRDC, "SCAT Sub-Assembly (Fairing)" Drawing Number B-893-4

3. Hydrospace-Challenger, Inc., "SCAT Winch Performance Tests", 6 and 7 March 1973, NSRDC Movie, M2420

4. Franklin Electric, "Instruction Manual for 20/40 Sea-Mersible Motor Model 2902029111"

5. Hale, Nevile, "Submarine Communications Handling System Study" Fathom Oceanology Limited Report No. 3.171A dated June 18, 1973

6. Fathom Oceanology Limited, Contract Specifications Submarine Communication Buoy Handling System Revision No. 1 dated July 18, 1973, Job No. 31171

APPENDIX A
SCAT WINCH-DRAWINGS
AND PARTS LIST (REVISED)

CONTENTS

CONTROL SHEET

NOTES:

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	F/N-11, NOMENCLATURE WAS, "DRIVE ASSY."	7/1/72	
B	DELETED F/N 22	2-28-73	

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

SHT	1	2		
REV	B	B		
SHT				
REV				

CERTIFICATION LEGEND

C CHEMICAL
P PHYSICAL
H HARDNESS
C/C CERTIFICATION OF CONFORMANCE
N/D NONDESTRUCTIVE TEST CONSISTING OF:
PT LIQUID PENETRANT INSPECTION
MT MAGNETIC PARTICLE INSPECTION
RT RADIOGRAPHIC INSPECTION
P PRESSURE TEST
UT ULTRASONIC TEST

DRAWN LP 26APR/72
CHECK LH 5/12/72
ENGR A. Hause 5/12/72
APPROVED

Western Gear Corporation
HEAVY MACHINERY DIVISION
EVERETT, WASHINGTON

PARTS LIST
SCAT WINCH ASSEMBLY

SIZE	CODE IDENT NO.		REV
B	13603	PLE301207	B

SCALE — WT. — LB SHEET 1 OF 2

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1	RT. SIDE PLATE ASSY	1		D303915	WGC	VAR	SEE DWG										
2	LT. SIDE PLATE ASSY	1		D303916	WGC	VAR	SEE DWG										
3	MAIN SHAFT ASSY	1		D303919	WGC	VAR	SEE DWG										
4	DRUM NO. 1 ASSY	1		E301215	WGC	VAR	SEE DWG										
5	DRUM NO. 2 ASSY	1		E301216	WGC	VAR	SEE DWG										
6	DRUM NO. 3 ASSY	1		E301217	WGC	VAR	SEE DWG										
7	BALL BEARING	2		C304612	WGC	VAR	SEE DWG									MOLY-LUBE PRIOR TO ASSY	
8	BEARING RETAINER	1		C304613	WGC	SST	QQ-S-766 CL 316L										
9	BEARING RETAINER (RT)	1		D303912	WGC	STL	QQ-S-141 CL A36 hr										
10	OUTER HOUSING	1		E301211	WGC	SST	QQ-S-766 CL 316L										
11	ASSY, INNER SHAFT	1		D303929	WGC	VAR	SEE DWG										
12	BALL 3/4 DIA	402			COML	ST SST										GRADE 100, SST TYPE 302	
13																	
14	HEX HD CAPSCREW	16			COML	ST STL	COML									1/4-20 NC X .75 LG	
15	HEX HD CAPSCREW	32			COML	ST STL	COML									3/8-16 NC X 1.25 LG	
16	HEX HD CAPSCREW	24			COML	ST STL	COML									7/16-14 NC X 1.00 LG	
17	HEX HD CAPSCREW	9			COML	ST STL	COML									5/8-11 NC X 1.50 LG	
18	LOCKWASHER	16			COML	ST STL	COML									1/4 MED	
19	LOCKWASHER	32			COML	ST STL	COML									3/8 MED	
20	LOCKWASHER	24			COML	ST STL	COML									7/16 MED	
21	LOCKWASHER	9			COML	ST STL	COML									5/8 MED	
22																	

SIZE	CODE IDENT NO.		REV
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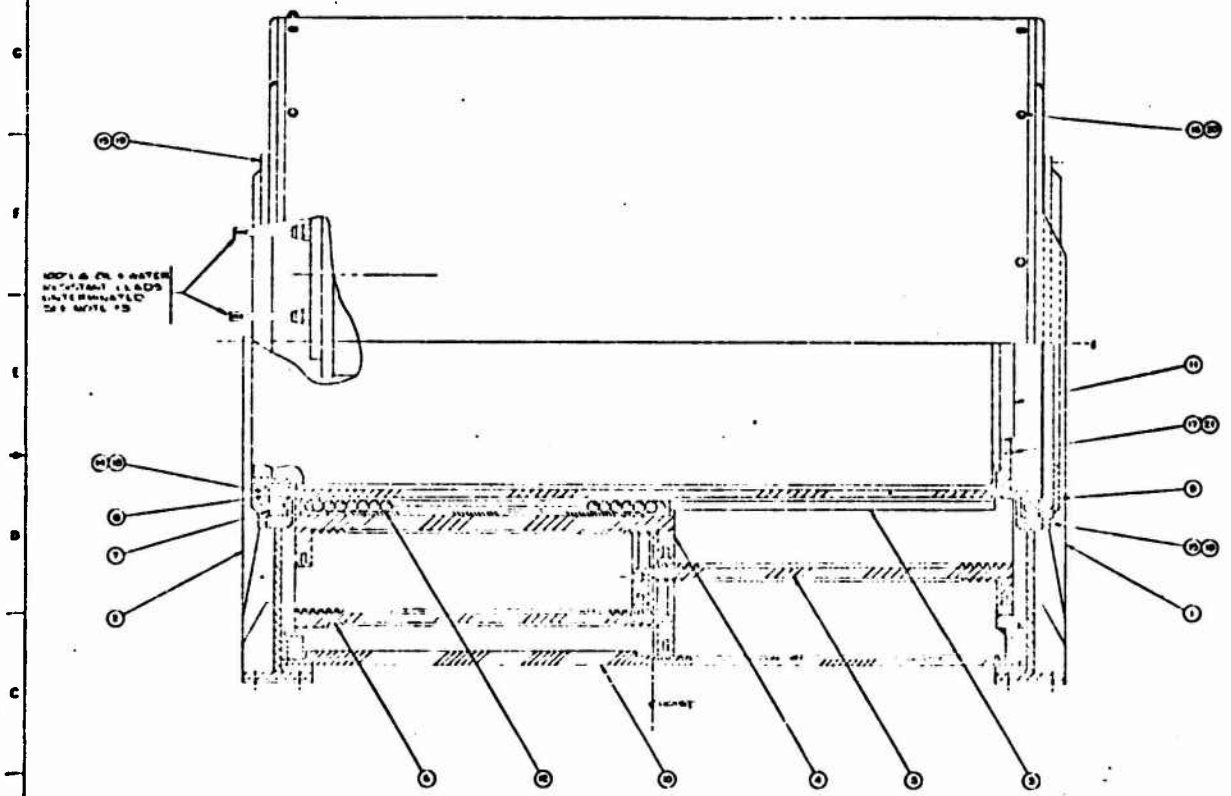
SCALE -	WT - LB	SHEET 2 of 2	



SECTION A-A

NOTES:

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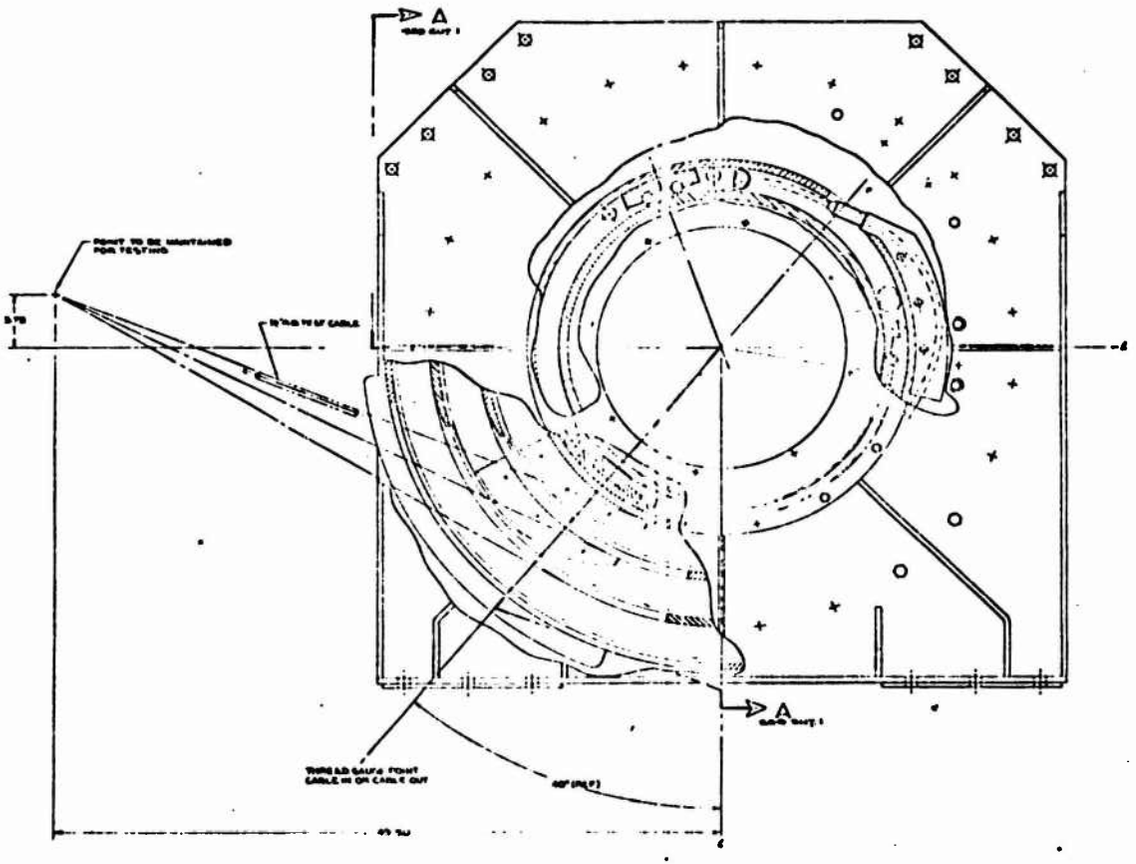
SEAT WINCH ASSEMBLY

16603



CONTROL SHEET

NOTES:

1. Painting instructions are listed on B-304095.
2. Lubrication drawing is C-304725.

REVISIONS				REVISIONS			
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B	F/N 13,32,34,35,40,47, & 48 DELETED. F/N 8,9,12,33,49,50,53, & 54 REVISED. F/N-8 WAS DRIVE SHAFT GLAND, C304036 F/N-9 WAS OUTER BEARING, C304037, ASTM A-36 F/N-12 WAS DRIVE SHAFT, QTY 1, C303913, AISI 4140, HEAT TREAT 250-280 BHN F/N-13 WAS OUTER BEARING RET., QTY 1, C303914 MOD, ASTM A-36 F/N-32 WAS BALL BEARING, QTY 1, 1207, SKF F/N-34 WAS OIL SEAL, QTY 1, 10404-LPD, J. MANVILLE F/N-35 WAS OIL SEAL, QTY 1, 10000-LPD, J. MANVILLE F/N-36 WAS OIL SEAL, QTY 1, 10855-LPD, J. MANVILLE F/N-40 WAS RETAINING RING, QTY 1, 5100-137, TRUARC F/N-47 WAS HEX HD CAPSCREW, QTY 4, ST. STL., 3/8-16 UNC X 3/4 LG. F/N-48 WAS LOCKWASHER, QTY 4, ST. STL., 3/8 MED. F/N-49 WAS QTY 6 - F/N-50 WAS QTY 8						

SHT	1	2	3	4
REV	A	-	-	A
SHT	1	2	3	4
REV	B	B	B	A

CERTIFICATION LEGEND
C CHEMICAL
P PHYSICAL
H HARDNESS
C/C CERTIFICATION OF CONFORMANCE
N/D NONDESTRUCTIVE TEST CONSISTING OF:
PT LIQUID PENETRANT INSPECTION
MT MAGNETIC PARTICLE INSPECTION
RT RADIOGRAPHIC INSPECTION
P PRESSURE TEST
UT ULTRASONIC TEST

Western Gear Corporation — HEAVY MACHINERY DIVISION, EVERETT, WASHINGTON

DRAWN CDC
CHECK L. Hayes
ENGR [signature] 4-14-72
APPROVED

PARTS LIST
ASSEMBLY, - INNER SHAFT

SIZE	CODE IDENT NO.		REV.
B	16603	PL 0303025	D

SCALE | WT. LB | SHEET 1 OF 4

FIND NO.	NOMENCLATURE	QTY.	CODE IDENT.	MANUFACTURER PART OR DWG NO.	MANUFACTURER NAME	MATL	MATL SPEC	REQ'D CERTS C	P	H	C/C	N/D	M	ALTERNATE SPEC FOR GOVT REFERENCE	WT LBS	REMARKS	MATL CLASS
1	PRIMARY PLANET CAGE	1	16603	D303925	WGC	STL	ASTM A36						X				
2	L.S. PLANET CAGE	1	16603	D303926	WGC	STL	ASTM A36						X				
3	PLANETARY RING GEAR	1	16603	D303927	WGC	CAST STEEL							X			HEAT TREAT 300-320 BHN	
4	INNER SHEET	1	16603	D303928	WGC	VAR							X				
5	PRIMARY PLANETARY PINION	1	16603	C304633	WGC	STL	AISI 4140						X			HEAT TREAT 350-370 BHN	
6	LOW SPEED PLANET GEAR	3	16603	C304634	WGC	STL	AISI 4140						X			HEAT TREAT 320-340 BHN	
7	SECONDARY PLANETARY PINION	1	16603	C304635	WGC	STL	AISI 4140						X			HEAT TREAT 350-370 BHN	
8	SUBMERSIBLE ELEC. MOTOR	1		C306416		VAR							X			460V, 3Ø, 60 HZ, 1800/3600RPM, 40/20HP	
9	MOTOR END PLATE	1	16603	C305465	WGC	S-STL	AISI 304L						X				
10	COMPENSATOR BASE	1	16603	C304638	WGC	STL	VARIOUS						X				
11	COMPENSATOR COVER	1	16603	C304639	WGC	STL	VARIOUS						X				
12	MOTOR MOUNT STUDS	3	16603	A303452	WGC	S-STL	AISI 303						X				
13													X				
14	DRAIN & FILL PIPE	2	16603	B303915	WGC	STL							X			1/2" BLK, SCHED. 80	
15	COMPENSATOR SPRING	1	16603	B303916	WGC	S. STL							X				
16	COMPENSATOR PISTON	1	16603	B303917	WGC	STL	VARIOUS						X				
17	PISTON GUIDE	1	16603	B303918	WGC	S. STL	TYPE 304L						X				
18	COMPENSATOR DIAPHRAGM	1	16603	B303919	WGC	VAR							X				
19	SHEAR BUSHING	3	16603	B303920	WGC	STL	AISI 4140						X			HEAT TREAT 250-280 BHN	
20	PLANET SHAFT	3	16603	B303921	WGC	STL	AISI 4140						X			HEAT TREAT 250-280 BHN	
21	THRUST WASHER	1	16603	B303922	WGC	BRZ	SAE 660						X				
22	THRUST BUSHING	1	16603	B303923	WGC	BRZ	SAE 660						X				
23	HIGH SPEED GEAR	1	16603	B303924	WGC	STL	AISI 4140						X			HEAT TREAT 300-320 BHN	
24	SEAL RING	1	16603	B303925	WGC	S. STL	TYPE 304L						X				
25	PRIMARY PLANET GEAR	3	16603	B303926	WGC	STL	AISI 4140						X			HEAT TREAT 320-340 BHN	
26	HIGH SPEED PINION	1	16603	B303927	WGC	STL	AISI 4140						X			HEAT TREAT 350-370 BHN	
27	THRUST WASHER	1	16603	A302013	WGC	BRZ	SAE 660						X				

SIZE	CODE IDENT NO.		REV
D	16603	PL D303929	B
SCALE	WT	LB	SHEET 2 of 4

FIND NO.	NOMENCLATURE	QTY.	CODE IDENT.	MANUFACTURER PART OR DWG NO.	MANUFACTURER NAME	MATL	MATL SPEC	REQ'D CERTS C	P	H	C/C	N/D	N	M	ALTERNATE SPEC FOR GOVT REFERENCE	WT LBS	REMARKS	MATL CLASS
28	COMPENSATOR ROD	1	16603	A302014	WGC	S.STL	TYPE 303						X					
29	BALL BEARING	6	52676	6212NR	SKF								X					
30	BALL BEARING	6	52676	6206NR	SKF								X					
31	BALL BEARING	5	52676	6209	SKF								X					
32																		
33	OIL SEAL	1		7203ST-LPD	J.MANVILLE								X					
34																		
35																		
36	"O" RING	1	92003	2-172	PARKER	BUNA-N							X				COMPOUND N525-60 ALT. N219-70	
37	"O" RING	1	92003	2-385	PARKER	BUNA-N							X				COMPOUND N525-60 ALT. N219-70	
38	"O" RING	1	92003	2-368	PARKER	BUNA-N							X				COMPOUND N525-60 ALT. N219-70	
39	RETAINING RING	1		5100-250	TRUARC								X					
40																		
41	HEX HD PLUG	1	92003	8P5ON	PARKER								X					
42	KEY	1	16603	AK-13F-1	WGC	STL	AISI 1018						X					
43	HEX HD BOLT	1				STL							X				5/8-11UNC X 7 LG	
44	SOC HD CAPSCREW	3				STL							X				5/8-11UNC X 3-1/4 LG	
45	SOC HD CAPSCREW	14				STL							X				5/8-11UNC X 1-3/4 LG	
46	LOCKWASHER	3				STL							X				5/8 MEDIUM	
47																		
48																		
49	HEX HD CAPSCREW	2				ST.STL							X				1/2-13 UNC X 1" LG	
50	LOCKWASHER	11				ST.STL							X				1/2 MEDIUM	
51	DOWEL PIN	3			ALLEN	STL							X				.6252 X 2	
52	DOWEL PIN	4			ALLEN	STL							X				.7502 X 2	
53	HEX HD CAPSCREW	6				ST.STL							X				1/2-13 UNC X 1-1/4 LG	
54	HEX NUT	3				ST.STL							X				1/2-13 UNC	

SIZE	CODE IDENT NO.		REV
B	16603	PL D303929	8
SCALE	WT LB	SHEET 3 of 4	

FIND NO.	NOMENCLATURE	QTY.	CODE IDENT.	MANUFACTURER PART OR DWG NO.	MANUFACTURER NAME	MATL	MATL SPEC	REQ'D CERTS C	P	H	C/C	N/D	N	ALTERNATE SPEC FOR GOVT REFERENCE	WT LBS	REMARKS	MATL CLASS
55	LOCKWASHERS	14				STL							X			5/8" HI COLLAR	
56	LOCKWASHERS	12				ST.STL							X			1/4" HI COLLAR	
57	SOC HD CAPSCREW	12				ST.STL							X			1/4- 20 UNC X 3/4	
58	LOCK NUT	1	13689	20FA616	FLEXLOC	ST.STL							X				
59	"O" RING	1	92003	2-268	PARKER								X			COMPOUND N525-60 ALT. N219-70	
60	"O" RING	1	92003	2-12	PARKER								X			COMPOUND N525-60 ALT. N219-70	
61	QUICK DISCONNECT CPLG.	2	78357	S3VHC6-6M.	SNAP TITE	ST.STL							X				
62	DUST PLUG	2	78357	S6SMPH-6	SNAP TITE	ST.STL							X			PLUG FOR F/I	
63	ELECTRICAL CONNECTOR	1	06324	GL30G 2P BC	GLENAIR	VARIOUS							X			PINS ON BOTH SIDES	
64	"O" RING	1	92003	2-213	PARKER	BUNA N							X			FURNISHED WITH F/N 63	
65	BRAKE PINION	1	16603	C304709	WGC	STL							X				
66	QUICK DISCONNECT NIPPLE	2	78357	VHN-6-6M	SNAP TITE	STL							X			USE ONLY WITH C304725. DO NOT INSTALL PERMANENTLY ON WINCH	
67	60A SCED ELECTRIC BRAKE	1	05805	C-671-HA	STEARNS	VAR.							X			SEE WG PO F-13564	
68	FEMALE CONN.	1	06324	GLDDG2S-F	GLENAIR	VAR.							X			WITH 48 INCH PIGTAIL	
69	SOLDER POT SOCKET	1	06324	GLSO-10	GLENAIR	VAR.							X				
70	SOLDER POT SOCKET	1	06324	GLSO-12	GLENAIR	VAR.							X				
71	DRUM HUB	1	05805		STEARNS	VAR.							X			FURNISHED WITH FN-67	
72	HEX HD CAPSCREW	1				STL.							X			$\frac{1}{2}$-13NC x $\frac{3}{4}$" LG	
73	LOCKWASHER	1				STL							X			$\frac{1}{2}$" MED	
74	FLATWASHER	1											X			$\frac{3}{16}$" WIDE TYPE B	
75	SOC HD CAPSCREW	6											X			$\frac{5}{8}$-16 NC x 2$\frac{1}{2}$ LG.	
76	LOCKWASHER	6											X			$\frac{5}{8}$" HI COLLAR	
77	KEY	1	16603	AK-13E-1	W.G.	STL.	AISI 101A						X				

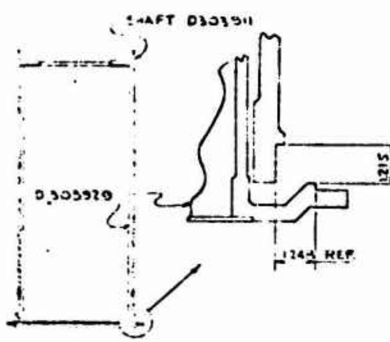
SIZE	CODE IDENT NO.		REV
B	16603	PL0303929	A
SCALE	WT LB	SHEET 4 OF 4	

6237

NOTE 1. ASSEMBLY AND DISASSEMBLY PRECAUTIONS:
[illegible] INNER SHAFT ASSEMBLY D303929 HAS BEEN INSTALLED IN SHAFT [illegible], THE LOW SPEED AND PRIMARY PLANET CAGES ARE NOT RETAINED [illegible]. THE INNER SHAFT CANNOT BE SAFELY OR SUCCESSFULLY [illegible] WITHOUT THE [illegible] OF F/N 43, [illegible] HEX HD BOLT, BEING INSTALLED [illegible] THE HOLE IN THE CENTER OF F/N 2. THIS BOLT RETAINS THE PLANET CAGES IN THE INNER SHAFT ASSEMBLY DURING HANDLING, INSTALLATION, AND REMOVAL OPERATIONS.
THIS BOLT [illegible] REMOVED AND REPLACED BY PLUG F/N 41 BEFORE THE ASSEMBLY CAN BE FILLED WITH OIL OR PUT IN OPERATION.

NOTE 2. DOWEL PINS - F/N 51 & 52 ARE TO BE STAKED IN PLACE AT ASSEMBLY.

NOTE 3. INITIAL END CLEARANCE ADJUSTMENT:



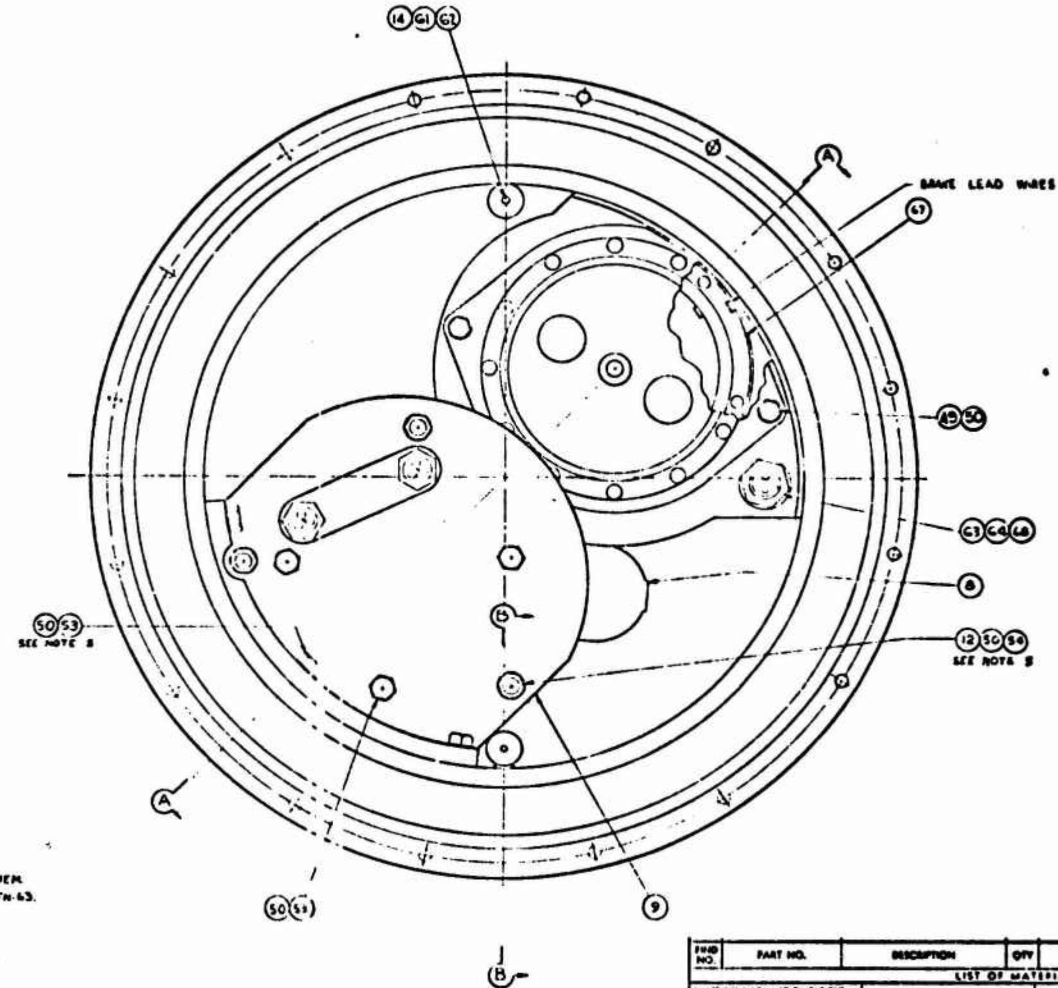
A. INNER SHAFT ASSEMBLY D303929 IS PLACED AS SHOWN. SEAL F/N 53 SHOULD NOT BE INSTALLED AND DRIVE SHAFT F/N 12 IS NOT REQUIRED. BOLT F/N 43 IS TIGHTENED TO 30 LB.FT. TORQUE.

B. SHAFT D303911 IS PLACED OVER THE INNER SHAFT.

C. THE CORRECT MEASUREMENT AT THE BEARING SEAT IS 1.215/1.225. THE ACTUAL MEASUREMENT AT THIS POINT IS TAKEN AND THE THICKNESS OF THRUST WASHER F/N 27 IS ADJUSTED TO GIVE THE PROPER BEARING SEAT MEASUREMENT.

NOTE 4 CUT THE BRAKE LEAD WIRES 12 INCHES LONG AND SOLDER FN-69 & FN 70 ONTO THEM AFTER THE BRAKE IS INSTALLED, [illegible] THE SOCKETS [illegible] THE BULKHEAD CONNECTOR FN-63.

NOTE 5 [illegible] FN-2 IN FN-4 & TORQUE TO 30 FT LBS.
[illegible] [illegible] TO MOTOR (FN-8). INSTALL USING O RING (FN-76)
[illegible] TORQUE HEX NUTS (FN-54) TO 20-25 FT LBS.
INSTALL REMAINING FASTENERS & TORQUE ALL CAPSCREWS (FN-53) TO 30 FT-LBS.



REVISIONS

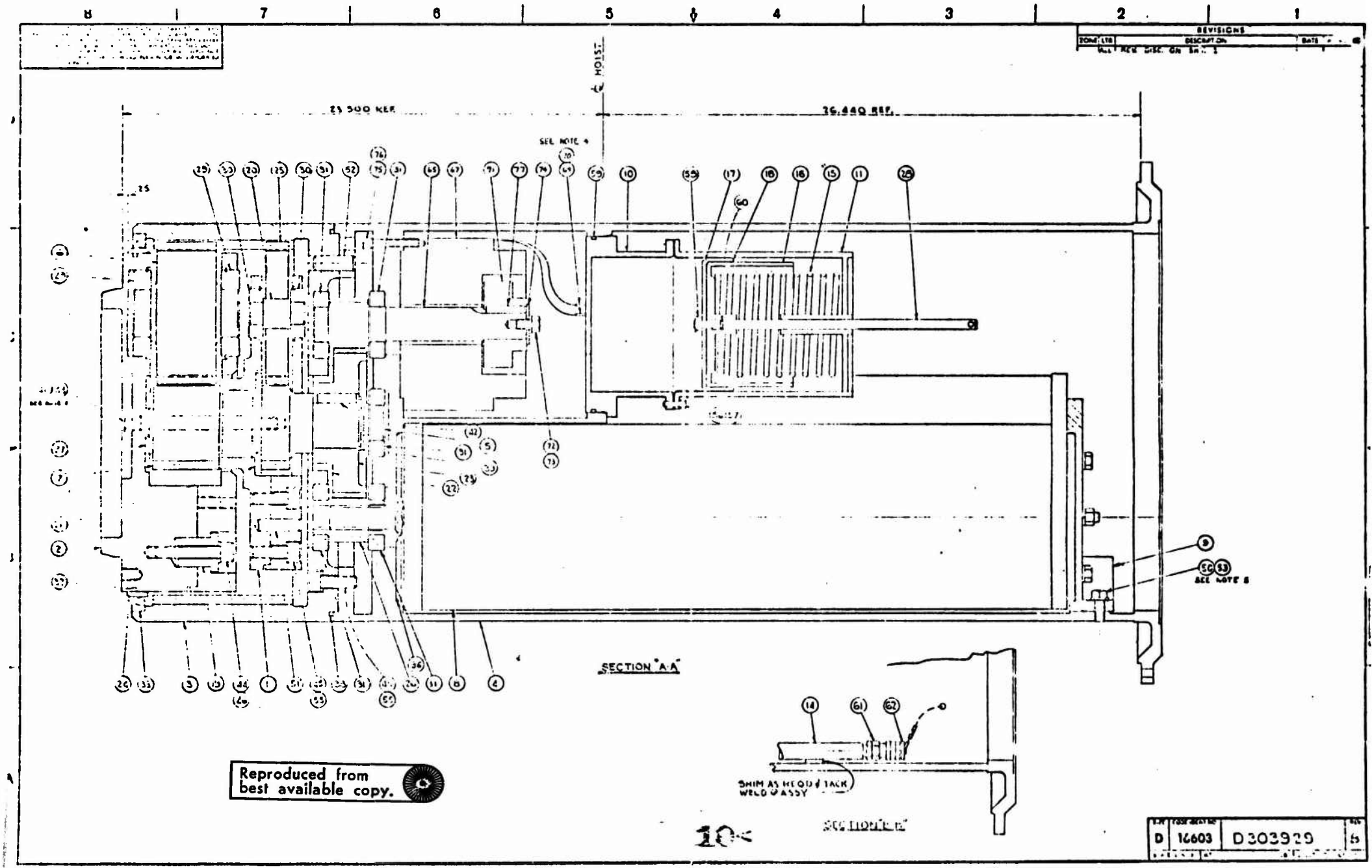
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	DELETE WEAR RING LOCK [illegible]		
	B	[illegible]		

FIND NO.	PART NO.	DESCRIPTION	QTY	MATERIAL	CODE IDENT

LIST OF MATERIAL

western HEAVY MACHINERY DIVISION

D 16603 D303[illegible]



APPENDIX B
HYDROSPACE-CHALLENGER, INC.
REQUEST FOR PROPOSAL NO. 73-371-900

EXHIBIT A

HYDROSPACE-CHALLENGER, INC. REQUEST FOR PROPOSAL NO. 73-371-900

1.0 GENERAL

1.1 TYPE OF CONTRACT

It is intended that a Firm Fixed-Price contract will be negotiated as a result of this solicitation. Proposals shall, therefore, be responsive to this type of contractual arrangement.

1.2 REQUEST FOR FURTHER INFORMATION

Requests for further information concerning this RFP shall be made in writing or telephoning only to the Subcontracts Administrator, Mr. George Bill, Hydrospace-Challenger, Inc. (HCI), 2150 Fields Road, Rockville, Maryland 20850, telephone: Area Code (301) 948-4350.

1.3 PROPOSAL DUE DATE

Proposals must be submitted on or before close of business on October 26, 1973 (4:00 P.M. EDT) prepared as outlined in Paragraph 2.0 "Instructions to Offerors".

1.4 REJECTION OR ACCEPTANCE OF PROPOSAL

It is the policy of HCI to solicit proposals only where there is a definite intention to award a contract. Such policy notwithstanding, HCI reserves the right to reject all proposals submitted in response to this RFP; provided that, in the opinion of the Subcontracts Adminstrator, award of a contract would not be in the best interest of the Company. HCI reserves the right to make an award without discussion of the proposal. Any award in response to this request for proposals will be a Subcontract to an HCI contract with the U.S. Navy. Therefore, award or any resultant contract will be contingent on receipt of Subcontract approval by the Navy contracting officer. In addition, award is contingent upon receipt by HCI of a contract modification authorizing funds for this procurement.

1.5 TREATMENT OF TECHNICAL DATA

The proposal submitted in response to this request may contain technical data which the offeror, or his subcontractor offeror, does not want used or disclosed for any purpose other than evaluation of the proposal. The use and disclosure of any such technical data may be so restricted; provided, the offeror marks the cover sheet of the proposal with the following legend, specifiying the pages of the legend:

> Technical data contained in pages _____, of this proposal shall not be used or disclosed, except for evaluation purposes, provided that if a contract is awarded to this submitter as a result of or in connection with the submission of this proposal, HCI shall have the right to use or disclose this technical data to the extent provided in the contract. This restriction does not limit HCI's right to use or disclose technical data obtained from another source without restriction.

HCI assumes no liability for disclosure or use of unmarked technical data and may use or disclose the data for any purpose.

1.6 PROPOSAL COST

This Request for Proposal does not commit or obligate HCI to pay any costs incurred in the submission of the proposal or in making necessary studies or designs for the preparation thereof, nor to procure or contract for services or supplies.

1.7 SECURITY CLASSIFICATION

The Statement of Work and attachment set forth herein are unclassified and proposals should be submitted accordingly. Contractor personnel may require access to higher classified documents; therefore, the selected contractor must possess or be

able to acquire a Secret "Facility Security Clearance". Security clearance, for those persons required to have such, will be obtained in accordance with the Industrial Security Manual for Safeguarding Classified Information (Attachment to DD Form 441), DOD Manual 5220.22.

1.8 SUBMISSION OF PROPOSALS

All copies of the proposals and information requested pertaining to this RFP must be properly wrapped to prevent premature opening. The proposal must be addressed to arrive in the designated office as follows:

Hydrospace-Challenger, Inc.
2150 Fields Road
Rockville, Maryland 20850

Attention: Mr. George Bill
Subcontracts Adminstrator

1.9 EXECUTED CONTRACT TO CONSTITUTE ENTIRE AGREEMENT

In the event of contract award, the definitive contract will constitute the entire agreement of the parties and will supersede any representations, commitments, conditions or agreement made orally or in writing prior to execution of the contract.

1.10 PERIOD OF OFFER

Proposals must be signed by an official authorized to bind the offeror and shall contain a statement to the effect that the proposal is firm for a period of sixty (60) days from the proposal due date set forth in paragraph 1.3 above.

1.11 LATE QUOTATIONS

(a) Quotations and modifications received at the office designated in the Request for Proposals after the close of business on the date set for receipt thereof (or after the time set for receipt if a particular time is specified) will not be

considered unless:

(i) they are received before award is made; and either

(ii) they are sent by registered mail, or by certified mail for which an official dated post office stamp (postmark) on the original Receipt for Certified Mail has been obtained and it is determined by the Government that the late receipt was due solely to delay in the mails, for which the quoter was not responsible; or

(iii) if submitted by mail (or by telegram if authorized) it is determined by HCI that the late receipt was due solely to mishandling by the Contractor after receipt at HCI; provided, that timely receipt at such installation is established upon examination of an appropriate data or time stamp (if any) of such installation, or of other documentary evidence of receipt (if readily available) within the control of such installation or of the post office serving it. However,

(b) Quoters using certified mail are cautioned to obtain a Receipt for Certified Mail showing a legible, dated postmark and to retain such receipt against the chance that it will be required as evidence that a late quotation was timely mailed.

(c) The time of mailing of late quotations submitted by registered or certified mail shall be deemed to be the last minute of the date shown in the postmark on the registered mail receipt or registered mail wrapper or on the Receipt for Certified Mail unless the quoter furnishes evidence from the post office station of mailing which establishes an earlier time. In the case of certified mail, the only acceptable evidence is as follows: (i) where the Receipt for Certified Mail identifies the post office station of mailing, evidence furnished by the quoter which establishes that the business day of that station ended at an earlier time, in which case the time of mailing shall

be deemed to be the last minute of the business day of that station; or (ii) an entry in ink on the Receipt for Certified Mail showing the time of mailing and the initials of the postal employee receiving the item and making the entry, with appropriate written verification of such entry from the post office station of mailing, in which case the time of mailing shall be the time shown in the entry. If the postmark on the original Receipt for Certified Mail does not show a date, the quotation shall not be considered.

1.12 CONTRACT PRICING PROPOSAL

Five (5) copies of Department of Defense Contract Pricing Proposal, DD Form 633-4, are enclosed with this solicitation. Offeror shall submit with offer two (2) copies of this DD Form for each contract phase completed in accordance with and accompanied by the supporting information required by the instructions on the reverse of the form. In addition, if offer exceeds $100,000, the following information shall be furnished:

(i) The size classification (large or small business) of each source listed pursuant to Footnote 5 of the instructions.

(ii) Organizational relationship, if any of each proposed offeror.

NOTE: Offeror shall also obtain from his prospective subcontractors, and furnish with his own cost and pricing data submission, DD Form 633-4 completed as specified herein, for each subcontract which is either (i) $1,000,000 or more, or (ii) both more than $100,000 and more than 10 percent of the contractor's proposed contract price; unless the contractor in his submission demonstrates to the satisfaction of the contracting officer that a prospective subcontract will be based on adequate price competition, or that a prospective subcontract estimate is

based on an established catalog or market price of a commercial item sold in substantial quantities to the general public, or a price set by law or regulation.

2.0 INSTRUCTION TO OFFERORS

2.1 GENERAL

The performance specifications for this procurement have been talored to permit the maximum possible latitude available with current technology to meet the requirements of the subject equipment. Consistent with this approach, minimum requirements have been specified in terms of the overall performance envelope with interfaces and constraints being called out only when necessary.

This RFP is for the procurement of the ancillary equipment for the SCAT winch. The proposed effort shall include the detailed design, fabrication, assembly and factory acceptance test of this equipment.

It is expected that the technical proposals submitted in response to this RFP will define in some detail the design approach proposed to implement the overall performance requirements and goals. The proposal will be evaluated on the basis of the relative suitability of the proposed approach as well as on the credibility of the performance schedule, prices and estimates made by the offerors. The contract to the successful offeror will invoke not only the general performance requirements specified in the initial bid package, but may also invoke additional characterisitcs defined in the offeror's proposal.

2.2 OUTLINE OF THE PROPOSAL

Offerors shall prepare their proposals in accordance with the following outline: (Each item a-c may be bound together.) The cost proposal shall be packaged separately.

a. Transmittal Letter
b. Technical Proposal
c. Business Management Proposal
d. Cost Proposal

Five (5) copies of the technical and business management proposals are required for evaluation purposes. Two (2) copies of the cost proposal are required.

2.2.1 Transmittal Letter

The transmittal letter is to be prepared on the responding company's letterhead. Its sole purpose is to document the submission of the proposal. Therefore, it should be brief and signed by an individual who is authorized to commit the company to the extent of work proposed.

2.2.2 Technical Proposal

No detailed outline for the contents of the technical proposal is specified. However, the technical proposal should indicate clearly the offeror's understanding of the problem, the scope of the effort involved, and should reflect his approach to implementing each of the contractor tasks specified in the Statement of Work. Pertinent prior experience and relevant corporate capability should be addressed. Resumes of key technical personnel should be included.

2.2.3 Business Management Proposal

The offeror's proposal should reflect clearly his business management plan for controlling the performance of any contract which may result from this RFP. The proposal should include organization charts showing separately and interrelating the company and the project organization in this effort. Cover company organization from the executive vice president level to the first

line of supervision and include technical, manufacturing, quality assurance and administrative organizations. The project leader must be identified and a description given of his authority and his accessibility to top management.

The offeror should describe his internal procedures for controlling his schedules including a description of the level of detail to which he will use schedule control techniques. The offeror should also describe his internal procedures for controlling costs. Progress reporting is to be accomplished as required by the statement of work. The offeror should include in his proposal the depth of activities he intends to cover and the timeliness of the reports.

2.2.4 Cost Proposal

The Cost Proposal shall be divided into two sections. The first section shall be a firm fixed-price quote for the execution of the design effort and shall contain sufficient backup and detail to allow evaluation. The second section shall contain a detailed fixed-price quote for execution of the manufacturing and testing effort and should be presented in sufficient detail to allow a reasonable cost evaluation.

2.3 PROPOSAL EVALUATION

A proposal evaluation committee made up of members of the HCI staff will be established. However, HCI reserves the right to conduct its evaluation in concert with Government personnel if this is deemed to be in the best interest of the overall program.

2.4 EVALUATION CATEGORIES

Technical proposals will be evaluated against criteria established under the following categories, with each category

given the indicated relative weighting:

Category 1 - Technical Approach (45%)
Category 2 - Corporate Capability and Experience (20%)
Category 3 - Project Personnel (15%)
Category 4 - Business Management (10%)
Category 5 - Cost (10%)

3.0 STATEMENT OF WORK

3.1 INTRODUCTION

The Naval Ship Research and Development Center (NSRDC) is presently involved in a program to design, fabricate and test a faired cable handling system. Hydrospace-Challenger, Inc. (HCI) has developed a multi-layer concentric drum winch to handle the faired towline for NSRDC. HCI, under contract to NSRDC, is now undertaking a development program for the ancillary equipment portion of the system.

3.2 PURPOSE

This Request for Proposals is a solicitation for the detail design, fabrication, assembly and factory acceptance testing of the ancillary equipment.

3.3 GENERAL BACKGROUND

Theoretical analyses performed by HCI show the need for full cable fairing in order to provide the required performance. A special winch was required to handle the faired cable since it must be submersible, operate by remote control, and be highly compact.

In order to satisfy these requirements, a winch was developed based on the use of:

(1) multiple drums,

(2) concentrically nested on a common shaft, and
(3) traversing axially along the shaft axis for level winding.

This winch is summarized by the acronym - Submersible, Concentric, Axially Traversing (SCAT) winch. In order to proceed with the submarine communications system development, the ancillary equipment must be procured. Attachment A presents a detail description of a concept of this equipment for guidance.

3.4 CONTRACTOR TASKS

The following tasks will be performed by the contractor.

3.4.1 Conduct Design

This will require the translation of the concept into hardware design. Involved will be drawings in sufficient detail for identification of components clearly, and the design calculations required to assure the adequacy of the design approach from the analytical standpoint. These calculations, as a minimum, should include stress, weight, power, control, and dimensional tolerance.

3.4.2 Evaluate Technical Feasibility

This would be an ongoing effort during 3.4.1 in which alternate approaches, within the confines of the concept defined in Attachment A, would be traded off based upon reliability, producibility, cost, etc. However, a preferred design with the highest probability of success would be the output of the effort.

3.4.3 Identify Interface Requirements

In order to be integrated into an appropriate sea-going testbed, all interface requirements for the ancillary equipment must be identified. At a minimum this would include power,

envelope and weight. HCI will be responsible for system integration, but will rely on input from the contractor for interface refinements and options.

3.4.4 Construction

This would encompass translating the design into hardware.

3.4.5 Factory Acceptance Testing

This requires functional testing to assure specification compliance. Submerged testing would not be required.

3.4.6 Project Control and Reporting

3.4.6.1 Meetings - It is anticipated that five (5) meetings between representatives of the Contractor, HCI, and NSRDC will be held during the course of the contract period. Four shall be held at the Contractor's facility; one at HCI-Rockville. The first meeting will be held at the Contractor's facility for the purpose of reviewing the preferred approach approximately three (3) weeks after contract award. The second meeting will be approximately two (2) weeks after submittal of design for the purpose of design review prior to commencing fabrication. This meeting will take place at HCI facility. The other meeting will be for progress review and acceptance testing as deemed necessary. Meetings may be omitted or additional meetings included as necessary and agreed upon.

3.4.6.2 Final Report - The contractor shall prepare and deliver five (5) copies of a final engineering report which documents program efforts and activity from inception. This report shall contain all information derived under the above tasks. This may include but not necessarily be restricted to:

a. Engineering drawings and diagrams
b. Design calculations
c. Discussion of system capabilities and shortcomings
d. Factory acceptance test data and results

With the exception of the design of proprietary components included in the ancillary equipment, the concepts and drawings prepared for this study shall become the property of the United States Government. A design, process, material, concept or the like may not be claimed as proprietary if it was first conceived and/or devleoped or reduced to practice under this contract.

4.0 GOVERNMENT PROPERTY

HCI will not provide any Government-owned property for the performance of the work hereunder. If an offeror intends to utilize Government property in the performance of this work, he should include in his proposal a schedule of the property to be utilized indicating its estimated cost, estimated usage, and his authority to so utilize.

5.0 SPECIAL PROVISIONS

The following clauses are the special provisions for inclusion in any contract awarded as a result of this RFP:

PROGRESS PAYMENTS

Progress payments shall be made to the Contractor when requested as work progresses, but not more frequenetly than monthly in amounts approved by the Contractor and upon the terms and conditions provided in ASPR 7-104.35. For the determination of allowability of costs, the Subcontractor shall submit progress billings using Standard Forms 1034 and 1035 via its cognizant DCAA office for prior approval. An original and six (6) copies

of each such invoice shall be forwarded to:

Hydrospace-Challenger, Inc.
2150 Fields Road
Rockville, Maryland 20850

Attention: Mr. Geogre Bill

All such invoices shall reference this Subcontract number, and shall be certified as follows:

> I hereby certify that the above bill is correct and just, that payment therefor has not been received, and that it is presented with the knowledge that the amount paid hereto will become the basis for a claim against the United States Government.

INSPECTION AND ACCEPTANCE POINT

All articles and/or services called for hereunder shall be delivered FOB desination to the Contractor's place of business or such other destination as may be designated by the Contractor. Final inspection and acceptance shall be made by the Contractor at the point of desitination, but in no event shall the Contractor make such acceptance until the Principal Contractor shall have first given approval, any other acts or representations notwithstanding.

NON-DISCLOSURE OF PROPRIETARY INFORMATION

To the extent that work under this contract requires access to proprietary data, either of the Contractor or of other companies, or data furnished by the Government for Government use only, the Subcontractor agrees to protect such data from unauthorized use or disclosure.

COMMERCIAL WARRANTY

The Subcontractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the Subcontractor gives to any customer for such supplies or services and that the rights and remedies provided by such warranties are in addition to and do not limit any rights afforded to the Contractor by any other clause of the subcontract.

DISPUTES

Except as otherwise provided in the Subcontract, any dispute concerning a question of fact arising under this Subcontract, which is not disposed of by agreement, shall be decided by the Contractor. Such decision shall be reduced to writing and a copy thereof mailed or otherwise forwarded to the Subcontractor. Within thirty (30) days after date of receipt of such copy, the Subcontractor may notify the Contractor in writing, of its disagreement with the decision. In the absence of such notice, said decision shall be final. In the event of notice from the Subcontractor as aforesaid of its disagreement, the Subcontractor may appeal said dispute by pursuing any right or remedy it may have at law or in equity in any court of competent jurisdiction.

Pending a final decision of a dispute hereunder, the Subcontractor shall diligently proceed with the performance of this Subcontract in accordance with the decision of the Contractor.

SUBCONTRACTS

No contract shall be made by the Subcontractor for the furnishing of any of the work herein contracted for without the written approval of the Contractor. For the purpose of this clause, purchase of raw materials or commercial stock items shall not be considered work.

INDEMNIFICATION

In the event the Subcontractor, its employees, agents or lower-tier Subcontractors enter premises occupied by or under the control of the Contractor in the performance of this subcontract, the Subcontractor agrees that it will indemnify and hold harmless the Contractor, its officers and employees from any loss, cost, damage, expense, or liability by reason of property damage or personal injury of whatsoever nature or kind arising out of, as a result of, or in connection with such performance occasioned by the negligent actions or omissions of the Subcontractor, its employees, agents or lower-tier subcontractors.

STABLIZATION OF PRICES, RENTS, WAGES, AND SALARIES

By Executive Order 11640 dated January 26, 1972, the President stablized prices, rents, wages, and salaries. The Subcontractor represents that to the best of his knowledge and belief, he is in complete compliance with Executive Order 11640. Further, the Subcontractor warrants that the amount invoiced under this subcontract will not exceed the lower of (1) the subcontract price, or (2) the maximum levels established in accordance with the order.

The Subcontractor agrees to insert the substance of this clause, including this paragraph, in all subcontracts for supplies or services issued under this subcontract.

GENERAL PROVISIONS

The provisions of the contract clauses set forth in the following paragraphs of the Armed Services.Procurement Regulations (ASPR) are incorporated into this contract by reference with the same force and effect as though set forth in full. All reference to ASPR provisions are to those in effect as of 1 August 1973.

GENERAL PROVISIONS

NO.	TITLE	ASPR SOURCE
1.	Definitions	7-103.1
2.	Payments	7-302.2
3.	Standard of Work	7-302.3
4.	Inspection	7-302.4
5.	Assignment of Claims	7-103.8
6.	Examination of Records by Comptroller General	7-104.15
7.	Federal, State, and Local Taxes	7-103.10 (a)
8.	Utilization of Small Business Concerns	7-104.14 (a)
9.	Default	7-302.9
10.	Termination	7-103.10
11.	Disputes	7-103.12
12.	Renegotiation	7-103.13
13.	Buy America Act	7-104.3
14.	Convict Labor	7-104.17
15.	Walsh-Healey Public Contract Act	7-103.17
16.	Contract Work Hours and Safety Standards Act - Overtime Compensation	7-103.16
17.	Equal Opportunity	7-103.18
18.	Officials Not To Benefit	7-103.19
19.	Covenant Against Contigent Fees	7-103.20
20.	Gratuities	7-104.16
21.	Authorization and Consent	7-302.21
22.	Notice and Assistance Regarding Patent Infringement	7-103.23
23.	Patent Rights	7-302.23 (b)
24.	Military Security Requirements	7-104.12
25.	Utilization of Labor Surplus Area Concerns	7-104.20

GENERAL PROVISIONS (continued)

NO.	TITLE	ASPR SOURCE
26.	Government Delay of Work	7-104.77
27.	Title and Risk of Loss	7-103.6
28.	Pricing of Adjustments	7-103.26
29.	Listing of Employment for Veterans	7-103.27
30.	Filing of Patent Applications	7-104.6
31.	Excess Profit	7-104.11 (a)
32.	Communist Areas	7-103.15
33.	Notice of Labor Disputes	7-104.4
34.	Limitation on Withholding of Payments	7-104.21
35.	Subcontracts	7-104.23
36.	Price Reduction for Defective Cost or Pricing Data	7-104.29
37.	Audit by Department of Defense	7-104.41 (a)
38.	Changes	7-304.1
39.	Rights in Technical Data	7-902.9

All reference to the Government and/or Contracting Officer in the above clauses shall mean Hydrospace-Challenger, Inc., and all references to Contractor shall mean the offeror except ASPR 7-104.15 and 7-104.41 (a) wherein reference to the Government and/or Contracting Officer shall remain as stated and reference to the Contractor shall mean the offeror.

Attachment (A)
RFP. 73-371-900

ANCILLARY EQUIPMENT SPECIFICATION

1.0 SCOPE

This specification defines the technical requirements and quality assurance provisions for the procurement of the Ancillary Equipment to be used in conjunction with faired cable handling winches on the AN/BSQ-5 winch. This equipment will facilitate the storage, launch and retrieval of the BIAS towed buoy from the USS POGY (SSN-647) while submerged and underway.

2.0 APPLICABLE DOCUMENTS

SHIPS-R-5666-Radio Set AN/BSQ-5-73371
NAVSEC Dwg. 802-4624173 - Bias Buoy Body
NAVSEC Dwg. 802-4624199 - Door Assembly
HCI Dwg. 73371017 - Ancillary Equipment Guide

3.0 REQUIREMENTS

3.1 GENERAL

The Ancillary Equipment shall meet the requirements for similar function equipment as given in SHIPS-R-5666 unless otherwise specified herein. It is desirable that this equipment be usable with the AN/BSQ-5 system, the SCAT winch or any alternate winch of suitable configuration.

3.2 EQUIPMENT TO BE HANDLED

Specifically the ancillary equipment shall store, launch and retrieve the BIAS Communications Buoy Assembly, and a sectionally faired tow cable.

3.2.1 BIAS BUOY

The buoy shall conform to NAVSEC Drawing 802-4624173, Buoy Body.

3.2.2 TOWLINE

The towline shall be sectionally faired with a maximum cord of 2.5 inches and a maximum thickness of 0.5 inches. Each section shall be about 2 inches in length.

3.3 INSTALLATION CONSTRAINTS

The ancillary equipment shall not infringe upon any of the platform structures as shown on 73371017. The equipment shall operate from the ships hydraulic system which is capable of providing 1350 psi. All control functions shall be compatible with the BIAS Buoy equipment as installed upon the USS POGY.

3.4 EQUIPMENT DESCRIPTION

The ancillary equipment assembly shall accomodate the following equipment:

a. Buoy cradle
b. Lifting boom
c. Doors
d. Towline cutter
e. Towline tension indicator
f. Streaming sheave

Drawing 73371017 is to be used as guidance in determining the proposed approach.

3.4.1 STRUCTURE

The structure contains all of the above equipment such that the entire assembly can be tested as a unit before installation.

3.4.2 CRADLE

The cradle serves to hold the buoy when it is stowed or when it is being launched or retrieved. The cradle shall be attached to a boom capable of raising the cradle out of the ancillary equipment assembly and into the slip stream above the submarine. The cradle shall maintain the buoy at an attitude of 0 to 6 degrees forward down angle as the boom moves throughout its travel. The cradle shall have an automatic provision for securing the buoy so that it will not float under slack cable conditions. Also a means shall be provided to lock down the cradle automatically when the cradle has been lowered. The mechanism shall automatically disengage when the cradle is raised.

3.4.3 LIFTING BOOM

The ancillary equipment assembly shall contain a lifting boom capable of raising the cradle into the slip stream from the stowed position and the reverse. Hydraulic cylinders shall be the means by which the cradle and lifting boom are raised and lowered.

3.4.4 DOORS

The doors shall be an integral part of the ancillary equipment and shall be similar to NAVSEC Dwg. 802-4264199. The doors shall be attached to the cradle lifting boom such that the doors will be open when the cradle is raised and closed when the cradle is lowered. The linkage shall be designed to insure that the doors are held rigid when open and are down tight and faired with the frame superstructure when closed. The doors shall be hinged to the frame structure in accordance with the drawing. The opening shall allow for towline kite up to the limits indicated in 3.4.7.

3.4.5 TOWLINE CUTTER

The ancillary equipment assembly shall include a power driven towline cutter which shall be capable of severing the specified towline (fairing and cable) upon command by the cable cutter switch.

3.4.6 TOWLINE TENSION INDICATOR

The towline tension indicator shall determine by an electrical transducer within 2 percent accuracy, tension values between 100 pounds and 6,000 pounds.

3.4.7 STREAMING SHEAVE

A special sheave shall be provided to facilitate towline payout and retrieval. It shall incorporate a fairing orientation device so that missaligned or broken fairings from any orientation can be properly aligned when entering the sheave. The sheave shall be mounted such that slack cable during cradle lowering and rasising can be accommodated. Provision shall be made in the sheave mounting to accommodate towline kite angles of up to 20 degrees to either side of centerline (athwartship).

3.5 DESIGN LOADS

All requirements of SHIPS-R-5666 shall be met with the exception of the towcable force and orientation. A tow cable force of 15,000 pounds acting through an arc of 20 to 90 degrees to the horizontal shall be assumed. Also a 20 degree kite angle under this load through the above arc shall be assumed. A normal operational load maximum of 6,000 pounds shall be allowable without any damage to the equipment.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 RESPONSIBILITIES FOR INSPECTION

The contractor is responsible for the performance of all inspection requirements specified herein.

4.1.1 QUALITY CONTROL

The contractor shall provide and maintain a quality control program in accordance with MIL-Q-9858.

4.2 TEST PROGRAM

The test programs for the Ancillary Equipment shall demonstrate and certify that all requirements of the specification have been satisfactorily incorporated into the equipment.

The Ancillary Equipment will be subjected to an intensive evaluation test program in a subsequent development program phase not covered by this specification. Therefore, no temperature, humidity, pressure, shock, vibration, noise, inclination testing shall be required by the contractor. However, the equipment shall be designed to meet the environmental conditions as specified in SHIPS-R-5666.

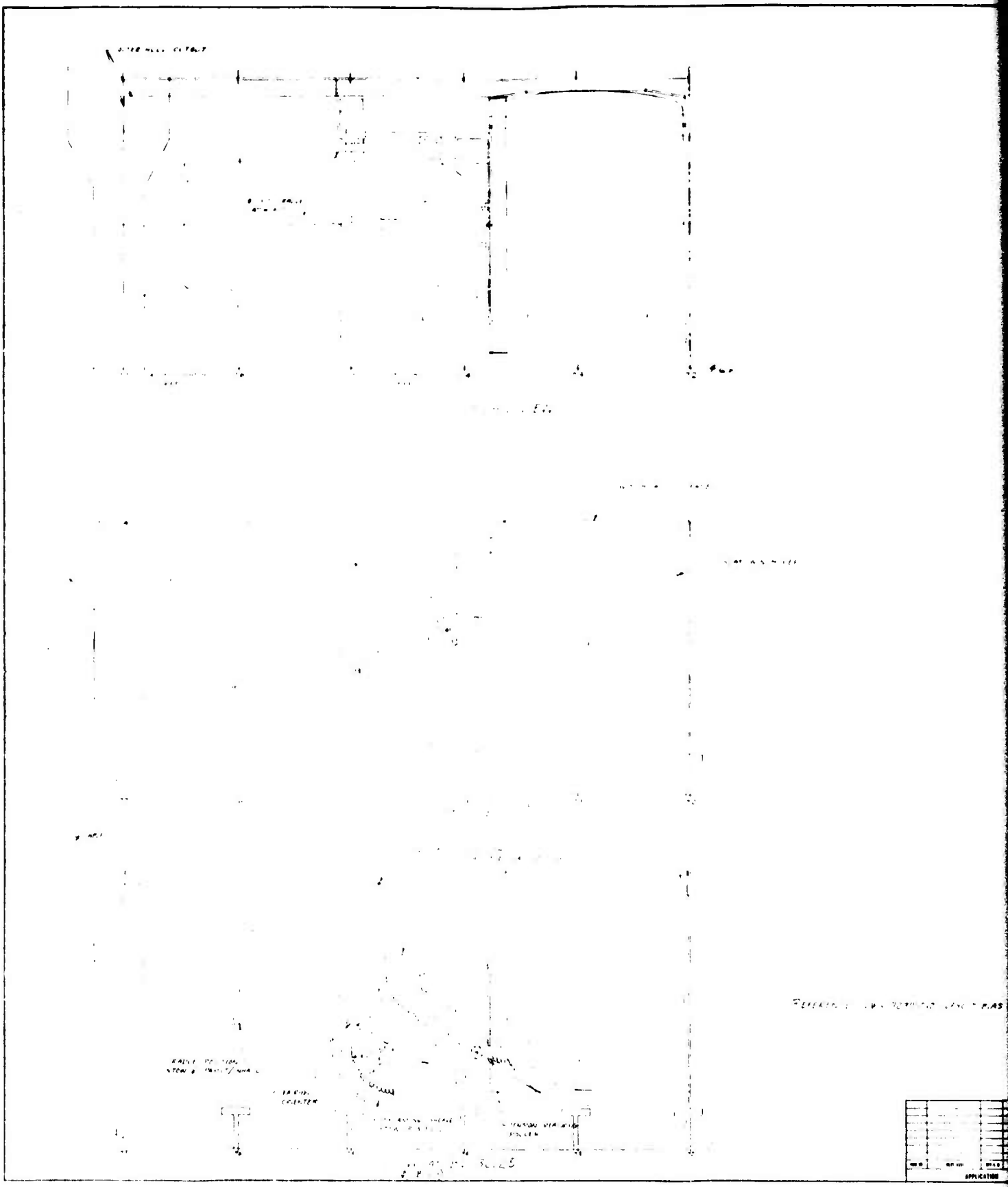
The testing requirements covered by this specification shall be restricted to landbased functional checkout of the operational characteristics of the equipment and the adequacy of the equipment to meet the design load-speed objectives. As a minimum the test procedures shall include:

NO LOAD

The equipment shall be raised and lowered under no load for 1/4 hour. The purpose of this test is to observe the functional operations of the mechanical elements of the equipment.

RATED LOAD

The equipment shall be operated raising and lowering the buoy for 1/4 hour. The equipment shall be subjected to the maximum towline operational load through various inclinations. The towline inhaul and payout speed shall be 150 feet/min during this test. A period under load of 10 minutes for each inclination shall be imposed.



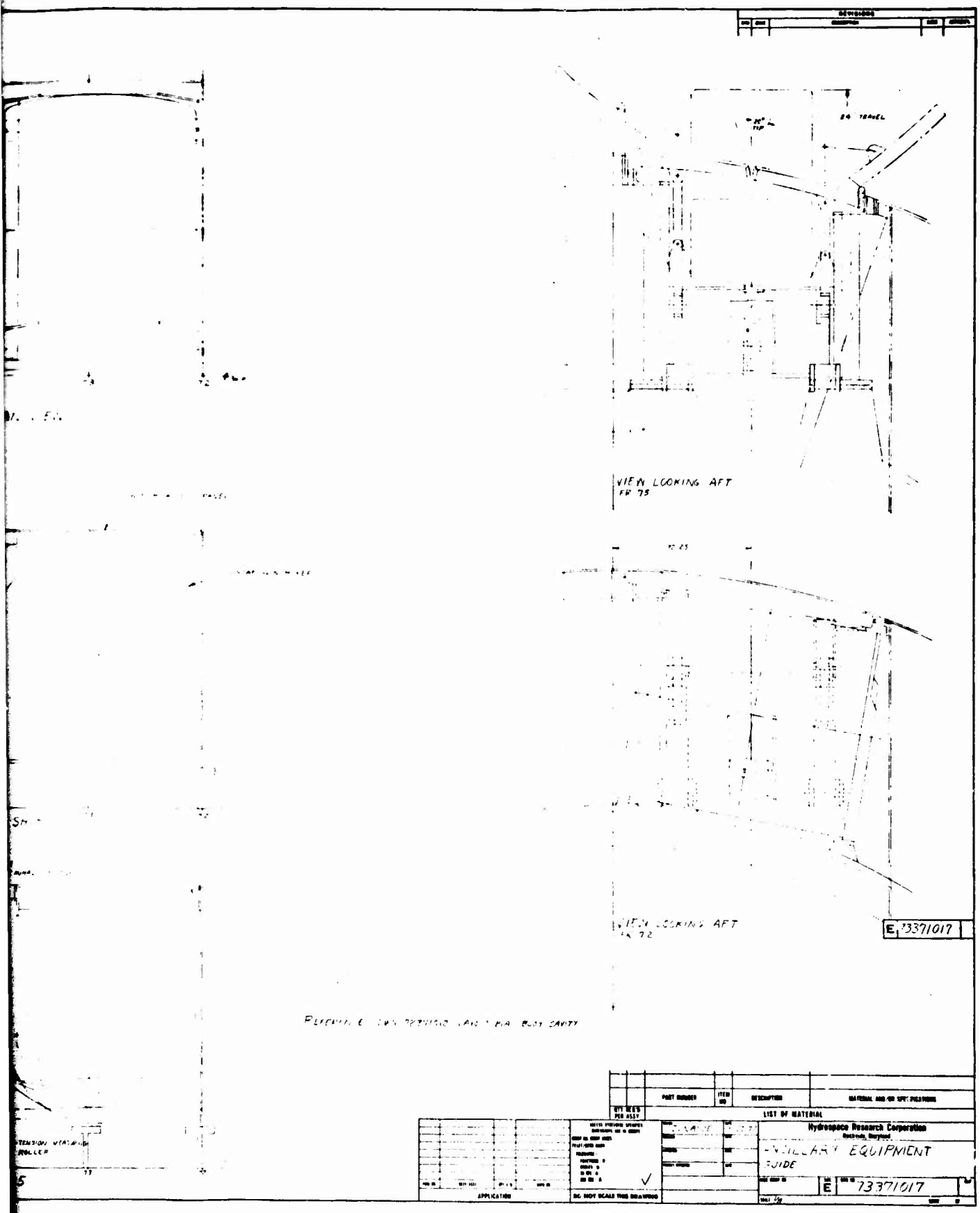


Figure B-1. Ancillary Equipment Guide

NOTICE TO OFFERORS

OFFERORS SHALL COMPLETE THE FOLLOWING REPRESENTATIONS AND CERTIFICATIONS, AND FURNISH ALL OTHER INFORMATION INDICATED HEREIN.

A. OFFEROR REPRESENTS AND CERTIFIES AS PART OF HIS PROPOSAL THAT:

1. Small Business

He (___) is, (___) is not, a small business concern. If offeror is a small business concern and is not the manufacturer of the supplies offered, he also represents that all supplies to be furnished hereunder (___) will, (___) will not, be manufactured or produced by a small business concern in the United States, its possessions, or Puerto Rico.

2. Regular Dealer/Manufacturer

He is a (___) regular dealer in, (___) manufacturer of, the supplies offered.

3. Contingent fee

a. He (___) has, (___) has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the offeror) to solicit or secure this contract, and b. he (___) has, (___) has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the offeror) any fee, commission, percentage or brokerage fee contingent upon or resulting from the award of this contract; and agrees to furnish information relating to a. and b. above, as requested by the Contracting Officer. (For interpretation of the representation, including the term "bona fide employee", see Code of Federal Regulations, Title 41, Subpart 1-1.5).

If the offeror, by checking the appropriate box provided therefor, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the offeror) to solicit or secure this contract, or that he has paid or agreed to pay any fee, commission, percentage, or brokerage fee to any company or person contingent upon or resulting from the award of this contract, he shall furnish, in duplicate, a completed Standard Form 119, Contractor's Statement of Contingent or Other Fees. If offeror has previously furnished a completed Standard Form 119 to the office issuing this solicitation, he may accompany his offer with a signed statement (a) indicating when such completed form was previously furnished, (b) identifying by number the previous solicitation or contract, if any, in connection with which such form was submitted, and (c) representing that the statement in such form is applicable to this offer.

4. Type of Business Organization

He operates as (___) an individual, (___) a partnership, (___) a nonprofit organization, (___) a corporation, incorporated under the laws of the State of _____ _____

5. Equal Opportunity

He (___) has, (___) has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause herein or the clause originally contained in Section 301 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114; that he (___) has, (___) has not, filed all required compliance reports; and that representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards. (The above representations need not be submitted in connection with contracts or subcontracts which are exempt from the clause).

6. **Buy American Certificate**

The offeror hereby certifies that each end product, except the end products listed below, is a domestic source end product (as defined in the clause entitled "Buy American Act"); and that components of unknown origin have been considered to have been mined, produced, or manufactured outside the United States.

Excluded End Products	Country of Origin

7. Certification of Independent Price Determination (Applicable only to proposals in excess of $2,500 where a firm fixed-price contract or fixed-price contract with escalation is to be awarded)

a. By submission of this proposal, the offeror certifies, and in the case of a joint offer, each party thereto certifies as to its own organization, that in connection with this procurement:

(1) the prices in this proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other offeror or with any competitor.

(2) Unless otherwise required by law, the prices which have been quoted in this proposal have not been knowingly disclosed by the offeror and will not knowingly be disclosed by the offeror prior to award, directly or indirectly to any other offeror or to any competitor; and

(3) No attempt has been made or will be made by the offeror to induce any other person or firm to submit or not to submit a proposal for the purpose of restricting competition.

b. Each person signing this proposal certifies that:

(1) He is the person in the offeror's organization responsible within that organization for the decision as to the prices being offered herein and that he has not participated, and will not participate, in any action contrary to a.(1) through a.(3) above; or

(2) (i) He is not the person in the offeror's organization responsible within that organization for the decision as to the prices being offered herein but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate in any action contrary to a.(1) through a.(3) above, and as their agent does hereby so certify; and (ii) he has not participated, and will not participate, in any action contrary to a.(1) through a.(3) above.

8. Certification of Nonsegregated Facilities (Applicable to contracts and subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause)

By the submission of this proposal, the offeror certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage of dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion or national origin, becuase of habit, local custom or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually or annually). NOTE: The penalty for making false statements in proposals is prescribed in 18 USC 1001.

9. **Designation of Cognizant Contractor Personnel. Offerors are requested to list below the names and telephone numbers of persons cognizant of contract administration and negotiation in connection with the quotation submitted in response to this solicitation. (See ASPR 3-501(b) Sec. B(vi))**

Administration _____, **Telephone** _____

Negotiation _____, **Telephone** _____

10. Affirmative Action Program (1970 AUG)(ASPR 12-806(b)(2) - Rev. 4-30-71)

(The following certification shall be completed by each offeror whose proposal is $50,000 or more and who has 50 employees or more)

The offeror certifies that he (___) has, (___) has not, developed and maintained at each of his establishments Equal Opportunity Affirmative Action Programs, pursuant to 41 CFR 60.2.

11. Certification of Equal Employment Compliance (1971 APR)(ASPR 12-806(b)(3) - Rev. 4-30-71)

(The following is applicable when the contract is not exempt from the Equal Opportunity clause)

By submission of this proposal, the offeror certifies that, to the best of his knowledge and belief except as noted below, up to the date of this proposal no written notice such as a show cause letter, a letter indicating probable cause, or any other formal written notification citing specific deficiencies, has been received by the offeror from any Federal Government agency or representative thereof that the offeror or any of its divisions or affiliates or known first-tier subcontractors is in violation of any of the provisions of Executive Order No. 11246 of September 24, 1965, Executive Order No. 11375 of October 13, 1967, or rules and regulations of the Secretary of Labor (41 CFR, Chapter 60) and specifically as to not having an acceptable affirmative action program or being in noncompliance with any other aspect of the Equal Employment Opportunity Program. It is further certified and agreed that should there be any change in the status of circumstances certified to above between this date and the date of expiration of this proposal or any extension thereof, the Government Contracting Officer cognizant of this procurement will be notified forthwith promptly.

12. **Royalty Information. The following statement is applicable if the work described in the Schedule will be performed in the United States, its possessions, or Puerto Rico, and the quoter estimates that the proposed contract will exceed $10,000:**

ROYALTY INFORMATION (1961 AUG.)

When the response to this solicitation contains costs or charges for royalties totaling more than $250, the following information shall be furnished with the offer, proposal, or quotation on each separate item of royalty or license fee:

(i) name and address of licensor;
(ii) date of license agreement;
(iii) patent numbers, patent application serial numbers or other basis on which the royalty is payable;
(iv) brief description, including any part or model numbers of each contract item or component on which the royalty is payable;

(v) percentage or dollar rate of royalty per unit;
(vi) unit price of contract item;
(vii) number of units; and
(viii) total dollar amount of royalties.

DD Form 783, Royalty Report, is approved for use in furnishing the above information. In addition, if specifically requested by the Contracting Officer prior to execution of the contract, a copy of the current license agreement and identification of applicable claims of specific patents shall be furnished. (ASPR 9-110(a)(3))

13. Government Surplus (1965 JAN)

a. In the event the proposal is based on furnishing items or components which are former Government surplus property or residual inventory resulting from terminated Government contracts, a complete description of the items or components, quantity to be used, name of Government agency from which acquired, and date of acquisition shall be set forth on a separate sheet to be attached to proposal. Notwithstanding any information provided in accordance with this provision, items furnished by the Contractor must comply in all respects with the specifications contained herein.

b. Except as disclosed by the Contractor in a. above, no property of the type described herein shall be furnished under this contract unless approved in writing by the Contracting Officer.

14. Industrial Facilities (Cost Type Solicitations)

Proposal shall include the following information regarding offeror's industrial facilities:

a. Statement that offeror now has or will acquire without cost to the Government all necessary facilities to perform the work described in the Schedule; or

b. (i) Indicate and estimate the cost of each of the items of industrial facilities the cost of which is included in offeror's estimated cost, and (ii) State that offeror now has or will acquire without cost to the Government all other necessary industrial facilities;

c. Specify and identify by contract number any Government-owned industrial facilities or special tooling offeror now has which is necessary for performance of this proposed procurement.

15. Listing of Employment Openings for Veterans (1971 NOV)

Offerors should note that this solicitation includes a provision which will be included in the contract requiring the listing of employment openings with the local office of the State employment service system if the award is for $10,000 or more and involves 400 or more man-days of employment.

16. Disclosure Statement - Cost Accounting Practices and Certification (DPC No. 99, 5-4-72)

Any contract in excess of $100,000 resulting from this solicitation, except when the price negotiated is based on: (1) established catalog or market prices of commercial items sold in substantial quantities to the general public, or (2) prices set by law or regulation, shall be subject to the requirements of the Cost Accounting Standards Board. Any offeror submitting a proposal, which, if accepted, will result in a contract subject to the requirements of the Cost Accounting Standards Board, must as a condition of contracting, submit a Disclosure Statement as required by regulations of the Board. The Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation (see (1) below) unless (i) the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated defense prime contracts during the period 1 July 1970 through 30 June 1971 totaling more than $30,000,000 (see (2) below), (ii) the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal (see (3) below), or (iii) post-award submission has been authorized by the Contracting Officer. CAUTION: A practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed to practice for pricing proposals or accumulating and reporting contract performance cost data.

Check the appropriate box below:

☐ 1. Certification of Concurrent Submission of Disclosure Statement(s)

The offeror hereby certifies that he has submitted, as a part of his proposal under this solicitation, copies of the Disclosure Statement(s) as follows: (i) original and one copy to the cognizant Administrative Contracting Officer (ACO); (ii) one copy to the cognizant contract auditor; and (iii) one copy to the Cost Accounting Standards Board, 441 G Street, N.W., Washington, D.C. 20548

Date of Disclosure Statement(s)	Name(s) and Address(es) of Cognizant ACO(s) Where Filed

The offeror further certifies that practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement(s).

☐ 2. Certificate of Monetary Exemption

The offeror hereby certifies that, together with all divisions, subsidiaries, and affiliates under common control, he did not receive net awards of negotiated national defense prime contracts during 1 July 1970 through 30 June 1971 totaling more than $30,000,000.

☐ 3. Certificate of Previously Submitted Disclosure Statement(s)

The offeror hereby certifies that the Disclosure Statement(s) were filed as follows:

Date of Disclosure Statement(s)	Name(s) and Address(es) of Cognizant ACO(s) Where Filed

The offeror further certifies that practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement(s).

17. Aluminum Ingot Representation. (Check appropriate box)

The following representation is applicable if this procurement involves items containing aluminum:

The quoter represents: that he (__) will, (__) will not use 10,000 pounds or more of aluminum products in the production of the items described in the Schedule.

If the quoter represents that 10,000 pounds or more of aluminum products will be used in the performance of the proposed contract, the Required Source for Aluminum Ingot clause set forth in ASPR will be included in the contract to be awarded as a result of this solicitation.

18. Labor Surplus Area Representation. The following representation is not applicable if notice of a set aside for labor surplus area concerns is set forth elsewhere in this solicitation.

This procurement is not set aside for labor surplus area concerns. However, the quoter's status as such a concern may affect entitlement to award in case of tie quotes to offer evaluation in accordance with the Buy American clause of this solicitation. In order to have his entitlement to a preference determined if those circumstances should apply, the quoter must:

(i) furnish with his quotation evidence that he or his first-tier subcontractor is a certified-eligible concern with a first preference in accordance with 29 CFR 8.7(b) and 8.9(c) or a certified-eligible concern with a second preference in accordance with 29 CFR 8.7(c) and 8.9(d), and identify below the address at which the costs he will incur on account of manufacturing or production (by himself if a certified concern or by certified concerns acting as first tier subcontractors) amount to more than 25 percent of the contract price; or

(ii) identify below the persistent or substantial labor surplus area in which the costs he will incur on account of manufacturing or production (by himself or his first-tier subcontractors) amount to more than 50 percent of the contract price. (If the quoter proposes to qualify as a persistent or substantial labor surplus area concern by including costs to be incurred by a certified concern not located in a labor surplus area, evidence of such certification must be furnished.)

_____

_____

19. Place of Performance. Offers submitted in response to this Request for Proposals must state the intended place of performance, including the street address, and the names and addresses of the owner and operator of producing facilities, if other than the quoter, when it is reasonably anticipated that such facilities will be used in the performance of the proposed contract. (See ASPR 3-501(b) Sec. B(x))

20. Rights in Technical Data Questionnaire (Check appropriate boxes) (561 - RFQ/RFP)

The RFQ/RFP delineates certain technical data, by means of specific description, referenced tables and specifications, that you are to deliver under the proposed contract. The "Rights in Technical Data" clause of the proposed contract establishes governmental rights to such data. With respect to any portion of such data (down to the component or process level):

(1) Is the Government to be entitled only to limited rights (as such term is used in said clause) in any such data pursuant to subparagraph (b)(2) of that clause:

Yes (__), No (__).

(2) Are you, your vendors or your subcontractors either unable or unwilling to furnish such data with Government rights attaching thereto in accordance with paragraph (b) of that clause:

Yes (__). No (__).

(3) The Government desires to enter into an agreement of the type contemplated by subparagraphs (b)(1)(vii) and (b)(2)(i) of that clause predetermining rights in such data. Indicate whether you are willing to do so:

Yes (__), No (__)

If the answer to any of the foregoing questions is yes (except for No. 3), you must identify the data concerned (to the component or process level) together with other salient facts, such as the identity of the firm involved. If the answer to question No. 3 is No, explain why you are not willing to predetermine rights.

B. IF BOX IS CHECKED, THE FOLLOWING IS APPLICABLE:

(X) 1. Cost and Price Analysis Forms

Five (5) copies of Department of Defense Contract Pricing Proposal, as applicable below, are enclosed with this solicitation. Offeror shall submit with proposal two (2) copies of applicable DD Form completed in accordance with and accompanied by the supporting information required by the instructions on the reverse of the form unless otherwise indicated below by Note B.

( ) a. DD Form 633 (See Notes A and C)

(X) b. DD Form 633-4 (See Notes A and C)

( ) c. DD Form 633-2 (Technical Publications)

( ) d. DD Form 633-1 (Technical Services)

NOTE A: If proposal exceeds $100,000 the following information shall be furnished:

(i) The size classification (large or small business) of each source listed pursuant to the Footnote of the instructions.

(ii) Organizational relationship, if any, of each proposed offeror.

Offeror shall also obtain from his prospective subcontractors, and furnish with his own cost and pricing data submission, DD Form 633/633-4, as appropriate, completed as specified herein, for each subcontract which is either (i) $1,000,000 or more, or (ii) both more than $100,000 and more than 10 percent of the contractor's proposed contract price; unless the contractor in his submission demonstrates to the satisfaction of the Contracting Officer that a prospective subcontract will be based on adequate price competition, or that a prospective subcontract estimate is based on an established catalog or market price of a commercial item sold in substantial quantities to the general public, or a price set by law or regulation.

( )

NOTE B: The detailed supporting information required by Instructions 2 and 3 and Note ___ on the reverse of applicable DD Form is not required.

NOTE C: If offeror claims exemption, for any portion of his price, from submission of certified cost or pricing data because price is based on catalog or market price or price set by law or regulation, DD Form 633-7 should be obtained and submitted in support of such portion of his price for which he is claiming the exemption.

(X) 2. Contractor's Technical Data Certification (ASPR 3-501(b) Sec. B(xiv))

The offeror shall submit with his offer a certification as to whether he has delivered or is obligated to deliver to the Government under any contract or subcontract the same or substantially the same technical data included in his offer; if so, he shall identify one such contract or subcontract under which such technical data was delivered or will be delivered, and the place of such delivery.

( ) 3. Contract Data Requirements List (DD Form 1423)

On procurements $100,000 or over, complete DD Form 1423 Blocks 25 and 26 in accordance with instructions attached hereto.

( ) 4. Excess Profit

It is expected that the quantities of items set forth below will constitute a portion of complete naval vessels or complete Army, Navy, or Air Force aircraft within the meaning of 10 USC 2382 and 10 USC 7300. If the aggregate contract prices for such quantities of items are $10,000 or more, such quantities of items will be subject to the provisions of 10 USC 2382 and 10 USC 7300 and the clause set forth below shall constitute a part of the resulting contract; provided, however, if it is determined by the Government at the time of execution of the resulting contract that any of the quantities of items listed in the clause are not subject to the above referenced sections, or that any quantity of any item not so listed is subject to said sections, the clause will be modified to reflect such determination and as so modified shall constitute a part of the resulting contract:

> The Contractor agrees that, unless otherwise provided by law, ...* of this contract shall be subject to all the provisions of 10 USC 2382 and 7300 and shall be deemed to contain all agreements required by those sections: Provided, however, that this clause shall not be construed to enlarge or extend by contract the obligations imposed by those sections. The Contractor agrees to insert in the subcontracts specified in those sections either the provisions of this clause or the provisions required by those sections.

*_____

_____
(Name of Offeror)

_____
(Signature/Title)

_____
(Date)

APPENDIX C
SUBCONTRACT NO. HCI 73-01
BETWEEN
HYDROSPACE-CHALLENGER, INC. AND
FATHOM OCEANOLOGY LIMITED
AND MODIFICATION

SUBCONTRACT NO. HCI 73-01

PRIME CONTRACT NO. N00014-71-C-0351

PRIORITY RATING DO-C9

SECURITY CLASSIFICATION Unclassified

TYPE Firm Fixed Price

TYPE OF INSPECTION:

HCI Source	GOVT. Source	HCI Destination	OTHER
		X	

SUBCONTRACT ADMINISTRATOR G. Bill

EG&G

HYDROSPACE-CHALLENGER, INC., 2150 FIELDS ROAD, ROCKVILLE, MARYLAND 20850 - TEL. 301, 948-4350

J-4371
27 January 1974
GLB/ef

Fathom Oceanology Ltd
863 Rangeview Road
Port Credit
Ontario, Canada

Subject: Modification to Subcontract No. HCI 73-01

I Subject subcontract is modified as follows: Article X is deleted in its entirety.

II All other terms and conditions remain unchanged.

III Total subcontract price and delivery remains unchanged.

HYDROSPACE-CHALLENGER, INC.

By Charles M Williams, VP Date 28 Feb '74

Fathom Oceanology Limited

By _____ Date Feb 6/74.

EG&G

HYDROSPACE-CHALLENGER, INC., 2150 FIELDS ROAD, ROCKVILLE, MARYLAND 20850 - TEL. 301, 948-4350

SUBCONTRACT NO. HCI 73-01

BETWEEN

HYDROSPACE-CHALLENGER, INC.
2150 Fields Road
Rockville, Maryland 20850

AND

FATHOM OCEANOLOGY LIMITED
863 Rangeview Road
Port Credit, Ontario
Canada

THIS FIRM FIXED-PRICE SUBCONTRACT is entered into effective the 1st day of December 1973, between HYDROSPACE-CHALLENGER, INC., (hereinafter referred to as the Contractor) and FATHOM OCEANOLOGY LIMITED (hereinafter referred to as the Subcontractor).

WHEREAS, the Contractor has entered into a contract with the Government of the United States (hereinafter referred to as the Principal Contract), said Contract being identified as Contract No. N00014-71-C-0351 and

WHEREAS, the parties have agreed that the Subcontractor shall undertake the performance of a portion of the work to be performed under the Principal Contract

NOW, THEREFORE, in consideration of the payments hereinafter agreed to be made, the mutual promises and covenants hereinafter set forth, and other good and valuable considerations, the parties hereto do mutually agree as follows:

ARTICLE I. SCOPE OF WORK

The Subcontractor, as an independent Subcontractor, and not as an agent of the Contractor, shall furnish the necessary qualified personnel, services, materials, and facilities to perform the work and deliver the reports specified in Exhibit "A", Statement of Work, and attachment thereto, attached hereto and made a part hereof.

ARTICLE II. PERIOD OF PERFORMANCE

The Subcontractor shall perform the work called for under ARTICLE I above, during the period commencing 1 December 1973, and continuing through 31 March 1974 unless earlier terminated as provided herein.

ARTICLE III. CONSIDERATION AND PAYMENT

In consideration of the satisfactory completion of the work and/or services described in ARTICLE I, and acceptance thereof by the Contractor, the Subcontractor shall be paid the sum of sixty thousand four hundred twenty-six United States dollars and no cents ($60,426.00).

Payments shall be made in accordance with the "PAYMENTS" clause of the General Provisions. For this purpose, items for which a price is separately stated in the contract are listed in Attachment (2) to Exhibit "A" as:

Item		Price
A001	Drawing Package Design Evaluation	$12,000.00
A002	Drawing Package Design Disclosure (Initial Submittal)	$24,000.00
A002	Drawing Package Design Disclosure (Final Submittal)	$24,426.00

ARTICAL IV. INSPECTION AND ACCEPTANCE POINT

All articles and/or services called for hereunder shall be delivered FOB destination to the Contractor's place of business or such other destination as may be designated by the Contractor. Final inspection and acceptance shall be made by the Contractor at the point of destination, but in no event shall the Contractor make such acceptance until the Principal Contractor shall have first given approval, any other acts or representations notwithstanding.

ARTICLE V. COMMERCIAL WARRANTY

The Subcontractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the Subcontractor gives to any customer for such supplies or services and that the rights and remedies provided by such warranties are in addition to and do not limit any rights afforded to the Contractor by any other clause of the subcontract.

ARTICLE VI. DISPUTES

Except as otherwise provided in the Subcontract, any dispute concerning a question of fact arising under this Subcontract, which is not disposed of by agreement, shall be decided by the Contractor. Such decision shall be reduced to writing and a copy thereof mailed or otherwise forwarded to the Subcontractor. Within thirty (30) days after date of receipt of such copy, the Subcontractor may notify the Contractor in writing, of its disagreement with the decision. In the absence of such notice, said decision shall be final. In the event of notice from the Subcontractor as aforesaid of its disagreement, the Subcontractor may appeal said dispute by pursuing any right or remedy it may have under the Disputes clause of the General Provisions.

Pending a final decision of a dispute hereunder, the Subcontractor shall diligently proceed with the performance of this Subcontract in accordance with the decision of the Contractor.

ARTICLE VII. SUBCONTRACTS

No contract shall be made by the Subcontractor for the furnishing of any of the work herein contracted for without the written approval of the Contractor. For the purpose of this clause, purchase of raw materials or commercial stock items shall not be considered work.

ARTICLE VIII. SECURITY REQUIREMENTS

It is anticipated that, in the performance of this subcontract, the Subcontractor will not require access to classified information and data.

ARTICLE IX. INDEMNIFICATION

In the event the Subcontractor, its employees, agents or lower-tier Subcontractors enter premises occupied by or under the control of the Contractor in the performance of this subcontract, the Subcontractor agrees that it will indemnify and hold harmless the Contractor, its officers and employees from any loss, cost, damage, expense, or liability by reason of property damage or personal injury of whatsoever nature or kind arising out of, as a result of, or in connection with such performance occasioned by the negligent actions or omissions of the Subcontractor, its employees, agents or lower-tier subcontractors.

In the event the Contractor, its employees, agents or lower-tier Subcontractors enter premises occupied by or under the control

of the Subcontractor in the performance of this subcontract, the Contractor --- agrees that it will indemnify and hold harmless the Subcontractor, its officers and employees from any loss, cost, damage, expense, or liability by reason of property damage or personal injury of whatsoever nature or kind arising out of, as a result of, or in connection with such performance occasioned by the negligent actions or omissions of the Contractor, its employees or agents.

ARTICLE X. LICENSE GRANT

(a) For the purpose of acquisition of technical data under this subcontract, the Government has accepted a predetermination of limited rights for those portions of the data specifically representing utilization of the following Patents Issued:

(1) The Concentric Double Drum Winch Arrangement which is subject to U.S. Patent 3,576,295 and U.S. Patent 3,782,319.

(2) The Floating Roller Arrangement at the Boom Head on the Ancilliary Equipment which is subject to Canadian Patent 923,378 and U.S. Patent 3,782,319.

(b) For the sole purpose of any subsequent contract with FATHOM OCEANOLOGY LIMITED for the manufacture of the article described by the Technical Data to be provided under this contract, FATHOM OCEANOLOGY LIMITED hereby grants the Government an irrevocable, nonexclusive, nontransferable, and paid up license under the patents and applications for patents listed above and any patents granted on such applications, and under any patents which may issue as the result of any reissue, division or continuation thereof, to practice by or cause to be practiced for the Government throughout the world, any and all of the inventions thereunder, in the manufacture and use of any article or material, in the use of any method or process, and in the disposition of any article or material in accordance with law; together with corresponding foreign patents and foreign applications for patents, insofar as the Contractor has the right to grant licenses thereunder without incurring an obligation to pay royalties or other compensation to others solely on account of such grant.

(c) No rights are granted or implied by the agreement under any other patents other than as provided above or by operation of law.

(d) Nothing contained herein shall limit any rights which the Government may have obtained by virtue of prior contracts or by operation of law or otherwise.

(e) Upon the completion of the tenth production unit by FATHOM OCEANOLOGY LIMITED of the Ancilliary Equipment the patent rights and limited data in (a)(2) above shall be modified to grant to the Government of the United States unlimited rights in data royalty free.

ARTICLE XI. GENERAL PROVISIONS

The provisions of the contract clauses set forth in the following paragraphs of the Armed Services Procurement Regulations (ASPR) are incorporated into this contract by reference with the same force and effect as though set forth in full. All reference to ASPR provisions are to those in effect as of 1 December 1973.

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GENERAL PROVISIONS

NO.	TITLE	ASPR SOURCE
1.	Definitions	7-103.1
2.	Payments	7-302.2
3.	Standard of Work	7-302.3
4.	Inspection	7-302.4 (b)
5.	Assignment of Claims	7-103.8
6.	Examination of Records by Comptroller General	7-104.15
7.	Federal, State, and Local Taxes	7-103.10 (d)
8.	Default	7-302.9
9.	Terminations	7-103.21 (b)
10.	Disputes	7-103.12 (b)
11.	Renegotiation	7-103.13 (b)(2)
12.	Officials Not to Benefit	7-103.19
13.	Covenant Against Contingent Fees	7-103.20
14.	Gratuities	7-104.16
15.	Authorization and Consent	7-302.21
16.	Notice and Assistance Regarding Patent Infringement	7-103.23
17.	Patent Rights	7-302.23 (c)
18.	Government Delay of Work	7-104.77
19.	Title and Risk of Loss	7-103.6
20.	Pricing of Adjustments	7-103.26
21.	Reporting and Refund of Royalties	7-104.8 (a)
22.	Limitation on Withholding of Payments	7-104.21 (a)
23.	Subcontracts	7-104.23
24.	Duty Free Entry of Listed Canadian Supplies	7-104.32
25.	Audit by Department of Defense	7-104.41 (a)
26.	Changes	7-304.1
27.	Rights in Technical Data	7-104.9 (a)
28.	Warranty of Technical Data	7-104.9 (o)(1)

All references to the Government and/or Contracting Officer in the above clauses shall mean HYDROSPACE-CHALLENGER, INC., and all references to Contractor shall mean FATHOM OCEANOLOGY LIMITED except ASPR 7-104.15 and 7-104.41(a) wherein reference to the Government and/or Contracting Officer shall remain as stated and reference to the Contractor shall mean FATHOM OCEANOLOGY LIMITED.

Balance of page intentionally left blank.

ARTICLE XII. CONTENTS OF SUBCONTRACT AND ORDER OF PRECEDENCE

The parties executing this subcontract agree that the Contract Instrument, in its entirety, consists of the following, which if not heretofore are hereby incorporated herein and made a part of this subcontract:

(1) Recital
(2) Schedule consisting of ARTICLES I through XII
(3) Signature Page
(4) Exhibit "A" Statement of Work

To the extent of any inconsistencies between the above, the rights and obligations of the parties hereto shall be governed by the following order of precedence: Recital, Schedule ARTICLES I through X and XII, ARTICLE XI, and any specifications or other documents which are made a part of this subcontract by reference or otherwise.

BOTH PARTIES hereto warrant and represent that they have full right, power and authority to execute this subcontract.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the day and year first above written.

HYDROSPACE-CHALLENGER, INC.

By Charles M. Williams Date 1-23-74

FATHOM OCEANOLOGY LIMITED

By [signature] Date Jan 17/74

Attachment (1)

EXHIBIT "A"
STATEMENT OF WORK

Prepare engineering drawings suitable for the manufacture of an improved BIAS handling system in accordance with the following:

a. Contract Specification Submarine Communication Buoy Handling System, Fathom Oceanology Limited; dated July 9, 1973, Revision No. 1, dated July 18, 1973.

b. SHIPS-R-5666 - Radio Set AN/BSQ-5-73371 where applicable to similar functional equipment.

c. Submarine Communications Handling System Study Final Engineering Report, Fathom Oceanology Limited; dated June 18, 1973, Report No. 3.171A with Revisions 1, September 30, 1973 and 2, October 26, 1973. Subsequently compiled in Proposal 3.171P dated December 4, 1973.

d. Letter from Fathom dated October 26, 1973 to HCI, Subject: Submarine Antenna Towing System.

e. Attachment (2) DD 1423 Improved BIAS Handling System.

f. Attachment (3) Additional Requirements 73-371-901. Revision A dated 26 December 1973.

In the event of conflict in the above documents the contractor shall be notified so that resolution can be promptly undertaken.

ATCH NR 2 TO EXHIBIT A

TO CONTRACT/PR

CONTRACT DATA REQUIREMENTS LIST

CATEGORY

SYSTEM/ITEM Improved BIAS

CONTRACTOR Fathom

1. SEQUENCE NUMBER	2. TITLE OR DESCRIPTION OF DATA / 3. SUBTITLE	6. TECHNICAL OFFICE	10. FREQUENCY	12. DATE OF 1ST SUBMISSION	14. DISTRIBUTION AND ADDRESSEES (Addressee - Regular Copies/Repro Copies)
4. AUTHORITY (Data Item Number)	5. CONTRACT REFERENCE	7. DD250 REQ / 8. APP CODE (A) / 9. INPUT TO IAC (X)	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBM/EVENT ID	

1. A001	2. DRAWING PACKAGE Design Evaluation	6. HCI	10. ONE/R	12. 30 Days	14. Hydrospace-Challenger Inc. 2150 Fields Road Rockville, MD 20850 Attn: L. Bonde TOTAL 3/0
4. DI-0001	5.	7. LT / 8. A / 9.	11.	13.	

16. REMARKS

Approval is for both format and content and allow 30 days for review. Approval is contingent upon both HCI and Government review findings.

15. TOTAL

1. A002	2. DRAWING PACKAGE, Design Disclosure	6. HCI	10. ONE/R	12. 75 Days	14. Hydrospace-Challenger Inc. 2150 Fields Road Rockville, MD 20850 Attn. L. Bonde TOTAL 3/1
4. DI-0002	5.	7. LT / 8. A / 9.	11.	13. 120 Days	

16. REMARKS

Drawings prepared as part of A001 shall be included in this package. 75 days submission not to include reproducible. Approval is for both format and content and allow 30 days for reviewing. Approval is contingent upon both HCI and Government review findings

15. TOTAL

PREPARED BY	DATE	APPROVED BY	DATE
L Bonde	11/28/73		11/28/73

DD FORM 1 JUN 66 1423 S/N 0102-014-1503

REPLACES EDITION OF 1 APR 65, WHICH IS OBSOLETE.

PAGE ___ OF ___ PAGES

DATA ITEM DESCRIPTION

2. IDENTIFICATION NO(S).	
AGENCY	NUMBER
HCI	DI-0001

1. TITLE

DRAWING PACKAGE, Design Evaluation

3. DESCRIPTION/PURPOSE

Provide Information necessary to review either a proposed design or change/modification to an existing one.

4. APPROVAL DATE

5. OFFICE OF PRIMARY RESPONSIBILITY

Engineering

6. DDC REQUIRED

8. APPROVAL LIMITATION

7. APPLICATION/INTERRELATIONSHIP

9. REFERENCES *(Mandatory as cited in block 10)*

MCSL NUMBER(S)

10. PREPARATION INSTRUCTIONS

1. The issue of the referenced documents (block 9) in effect on the date of the invitation for bid or request for proposal form a part of this Data Item Description to the extent specified herein.

2. These drawings shall provide all essential information needed to permit an evaluation or a feasibility study of a proposed new design (or change/modification).

3. Also included in this package shall be engineering calculations sufficient to justify the design. This should include as a minimum stress, weight and power.

4. Drawings shall include as applicable, but shall not be limited to: lists of parts, details of assembly, layout information, interface control data, logic diagrams, schematics, performance characteristics, design limitations, and details of new materials and processes.

5. The drawings are to be prepared to the contractor's normal drafting practices. They shall be legible and shall satisfy the intended use as specified in paragraphs 2 and 3. of this DID. Unless otherwise specified in the contract, the following is applicable:

a. Safeguarding classified information. Engineering drawings containing classified information shall be safeguarded in accordance with provisions of the Department of Defense Industrial Security Manual for Safeguarding Classified Information.

b. Identification of rights to data. Engineering drawings containing information which under the terms of the contract or order may not be used by either the Government or HCI for manufacture or procurement shall be clearly identified as specified in the contract.

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S).	
	AGENCY	NUMBER
1. TITLE DRAWING PACKAGE, Design Disclosure	HCI	DI-0002

3. DESCRIPTION/PURPOSE

To permit procurement and manufacturing of items that are substantially identical to original items (including repair parts).

4. APPROVAL DATE

5. OFFICE OF PRIMARY RESPONSIBILITY
Engineering

6. DDC REQUIRED

8. APPROVAL LIMITATION

7. APPLICATION/INTERRELATIONSHIP

This DID should be applied whenever procurement of the substantially identical to original items is planned or when repair parts for the item (hardware) are being procured.

9. REFERENCES (*Mandatory as cited in block 10*)

MCSL NUMBER(S)

10. PREPARATION INSTRUCTIONS

1. The referenced documents (block 9) of the issue in effect on the data of invitation for bids or request for proposal, form a part of this Data Item Description to the extent specified herein.

2. Drawings shall provide the necessary design, engineering, manufacturing, and quality support information directly or by reference to enable the procurement, without additional design effort or recourse to the original design activity, of an item that duplicates the physical and performance characteristics of the original design.

3. These drawings shall not provide manufacturing process information unless this information is essential to accomplish manufacture of an identical item by other than the original source.

4. This package shall include, as applicable, but shall not necessarily be limited to: details of unique processes essential to design and manufacture; details of performance ratings; dimensional and tolerance data; critical manufacturing assembly sequences; toleranced input and output parameters; schematics; mechanical and electrical connections; physical characteristics, including form and finishes; details of material identification; inspection test, and evaluation requirements and criteria; necessary calibration information; and quality control data.

5. For items not developed at Government expense, or for which the government has not acquired unlimited rights, or when vendor or commercial items used exactly as procurred from the manufacturer are not covered by Government or nationally recognized industry association standards or specifications, engineering drawings shall conform to the following:

a. These drawings shall provide sufficient description directly or by reference to permit the procurement of the same items in the future from the original manufacturer, or functionally and physically interchangeable items from other sources.

b. Drawings shall include, as applicable, but shall not necessarily be limited to: details of performance ratings; outline and mounting dimensions; toleranced input and output parameters; schematics; mechanical and electrical connections; finishes and materials details when essential to operations and interchangeability; inspection, test, and evaluation requirements and criteria; calibration data when necessary; and vendor item identification of sources of supply.

6. The drawings are to be prepared to the contractual normal drafting practices. They shall be legible and shall satisfy the intended use as specified in paragraphs 2 and 5 of this DID. Unless otherwise specified in the contract, the following is applicable:

a. Safeguarding classified information. Engineering drawings containing information shall be safeguarded in accordance with provisions of the Department of Defense Industrial Security Manual for Safeguarding Classified Information.

b. Identification of rights to data. Engineering drawings containing information which, under the terms of the contract or order may not be used by either the Government or HCI for manufacture or procurement, shall be clearly identified as specified in the contract.

Attachment (3)
73-371-901
Rev A
Dated 26 December 1973

ADDITIONAL REQUIREMENTS

1.0 GENERAL

The Handling Equipment shall meet the requirements for similar function equipment as given in SHIPS-R-5666 unless otherwise specified herein. It is desirable that the ancillary equipment be usable with the AN/BSQ-5 system and the SCAT winch.

2.0 EQUIPMENT TO BE HANDLED

Specifically the equipment shall store, launch and retrieve the BIAS Communications Buoy Assembly, and a sectionally faired tow cable.

2.1 BIAS BUOY

The buoy shall conform to NAVSEC Drawing 802-4624173, Buoy Body.

2.2 TOWLINE

The towline shall be sectionally faired with a maximum cord of 2.5 inches and a maximum thickness of 0.5 inches. Each section shall be about 2 inches in length.

2.3 INSTALLATION CONSTRAINTS

The ancillary equipment shall not infringe upon any of the platform structures as shown on 72371012. The equipment shall operate from the ships hydraulic system which is capable of providing 1350 psi. All control functions shall be compatible with the BIAS Buoy equipment as installed upon the USS POGY.

2.4 EQUIPMENT DESCRIPTION

The ancillary equipment assembly shall accomodate the following equipment:

a. Buoy cradle
b. Lifting boom
c. Doors
d. Towline cutter
e. Towline tension indicator
f. Streaming sheave

Drawing 72371013 is to be used as guidance in determining the proposed approach.

2.4.1 STRUCTURE

The structure contains all of the above equipment such that the entire assembly can be tested as a unit before installation.

2.4.2 CRADLE

The cradle serves to hold the buoy when it is stowed or when it is being launched or retrieved. The cradle shall be attached to a boom capable of raising the cradle out of the ancillary equipment assembly and into the slip stream above the submarine. The cradle shall maintain the buoy at an attitude of 0 to 6 degrees forward down angle as the boom moves throughout its travel. The cradle shall have an automatic provision for securing the buoy so that it will not float under slack cable conditions. Also a means shall be provided to lock down the cradle automatically when the cradle has been lowered. The mechanism shall automatically disengage when the cradle is raised.

2.4.3 LIFTING BOOM

The ancillary equipment assembly shall contain a lifting boom capable of raising the cradle into the slip stream from the stowed position and the reverse. Hydraulic cylinders shall be the means by which the cradle and lifting boom are raised and lowered.

E2<

2.4.4 DOORS

The doors shall be an integral part of the ancillary equipment and shall be similar to NAVSEC Dwg. 802-4264199. The doors shall be attached to the cradle lifting boom such that the doors will be open when the cradle is raised and closed when the cradle is lowered. The linkage shall be designed to insure that the doors are held rigid when open and are down tight and faired with the frame superstructure when closed. The doors shall be hinged to the frame structure in accordance with the drawing. The opening shall allow for towline kite up to the limits indicated in 2.4.7.

2.4.5 TOWLINE CUTTER

The ancillary equipment assembly shall include a power driven towline cutter which shall be capable of severing the specified towline (fairing and cable) upon command by the cable cutter switch.

2.4.6 TOWLINE TENSION INDICATOR

The towline tension indicator shall determine by an electrical transducer within 2 percent accuracy, tension values between 100 pounds and 6,000 pounds.

2.4.7 STREAMING SHEAVE

A special sheave shall be provided to facilitate towline payout and retrieval. It shall incorporate a fairing orientation device so that missaligned or broken fairings from any orientation can be properly aligned when entering the sheave. The sheave shall be mounted such that slack cable during cradle lowering and raising can be accommodated. Provision shall be made in the sheave mounting to accommodate towline tension of up to 3000 pounds with kite angles of up to 15 degrees to either side of centerline (athwartship).

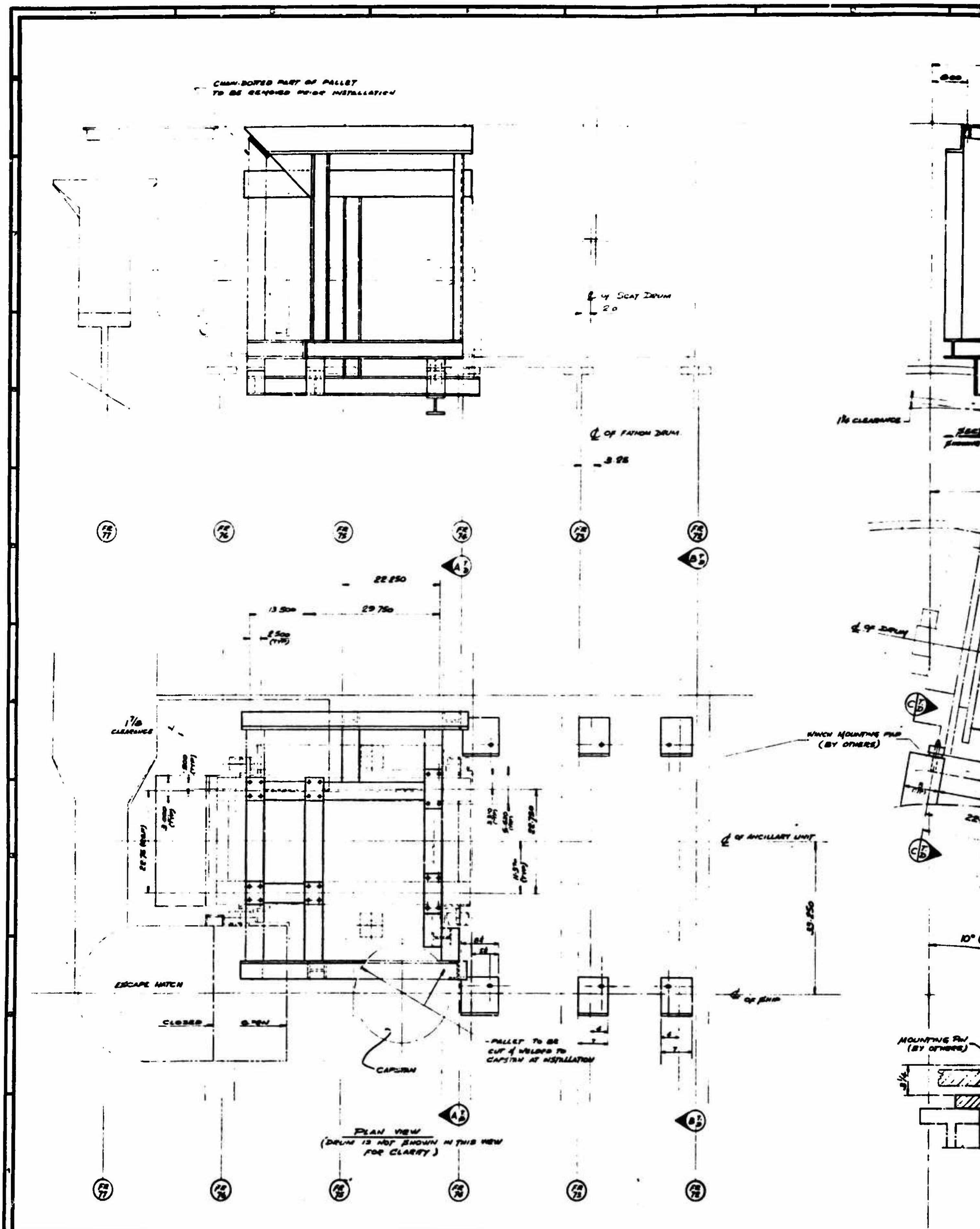
2.5 DESIGN LOADS

All requirements of SHIPS-R-5666 shall be met with the exception of the towcable force and orientation. A tow cable force of 15,000 pounds acting through an arc of 26 to 90 degrees to the horizontal shall be assumed. Also a 20 degree kite angle under this load through the above arc while the doors are closed shall be assumed. A normal operational load maximum of 6,000 pounds under the above towline angles shall be allowable with out any damage to the equipment.

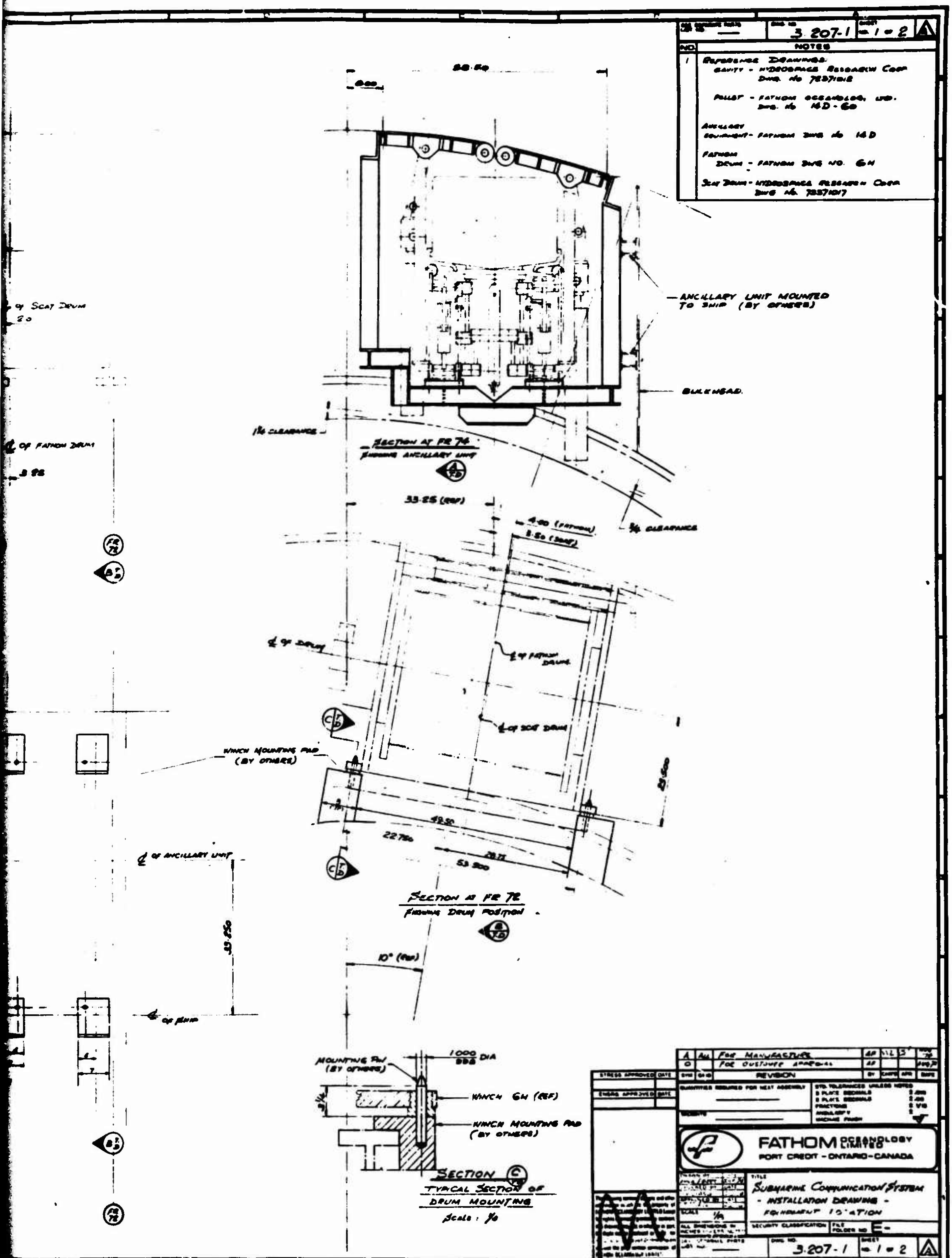
E4<

APPENDIX D
SUBMARINE COMMUNICATION SYSTEM
DRAWINGS AND PARTS LISTS

CONTENTS



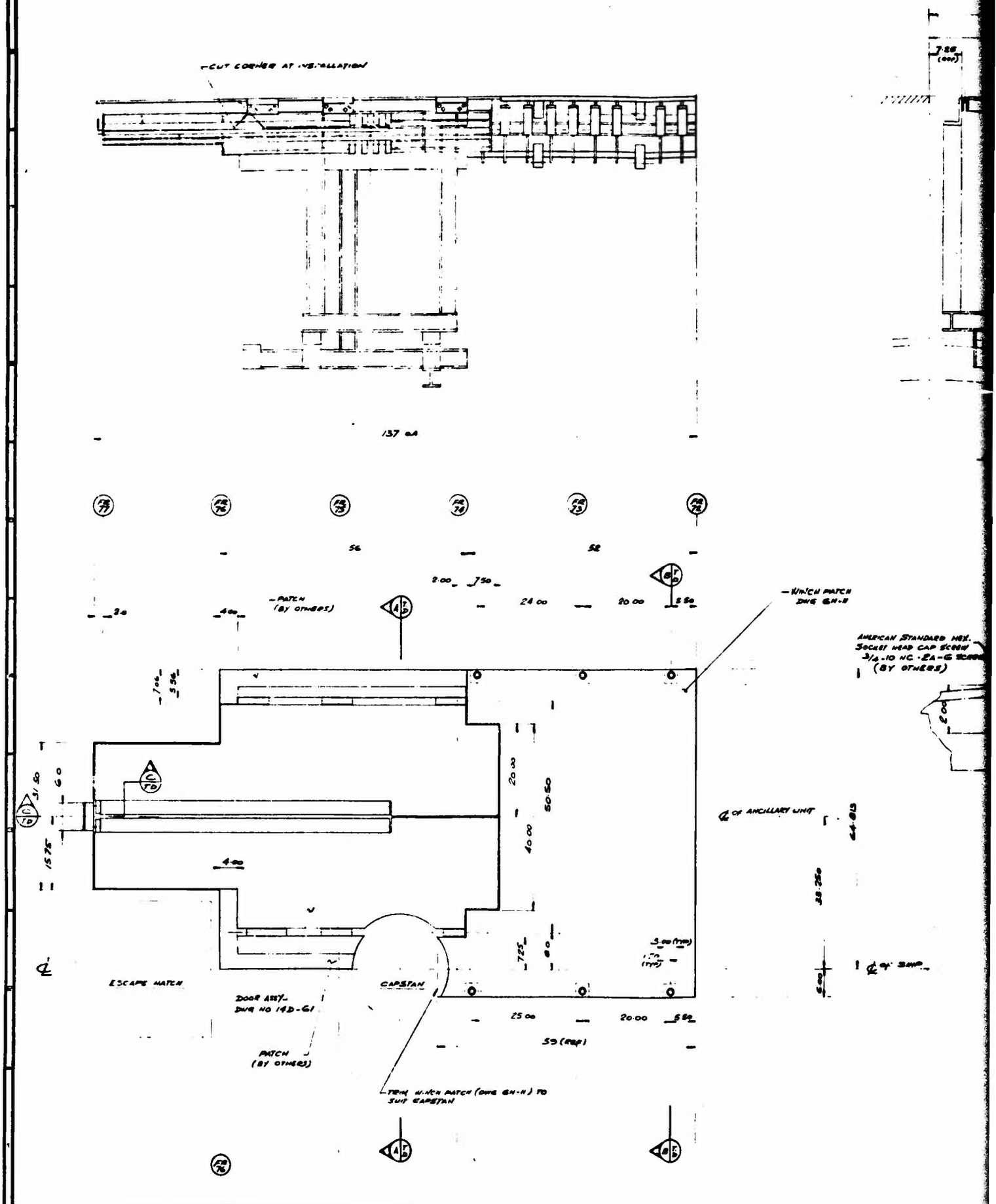
PLAN VIEW
(DRUM IS NOT SHOWN IN THIS VIEW FOR CLARITY)



3.207-1
1 of 2
NOTES
1 Reference Drawings.
Cavity - Hydrospace Research Corp
Dwg. No 7537101
Pallet - Fathom Oceanology Ltd.
Dwg. No 14D-60
Ancillary Equipment - Fathom Dwg No 14D
Fathom Drum - Fathom Dwg No. 6H
Scat Drum - Hydrospace Research Corp
Dwg No. 7357017
Ancillary unit mounted to ship (by others)
Bulkhead
Section at FR 74
Showing ancillary unit
33.25 (REF)
Section at FR 72
Showing drum position
10° (REF)
Winch mounting pad (by others)
Mounting pin (by others)
Winch 6H (REF)
Section C
Typical section of drum mounting
Scale: 1/8
A For Manufacture
O For customer approval
REVISION
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
Submarine Communication System
- Installation Drawing -
Equipment Location
3.207-1
1 of 2

B

66


CUT CORNER AT INSTALLATION
137 64
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52
24 00
20 00
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WINCH PATCH DWG GH-11
AMERICAN STANDARD HEX. SOCKET HEAD CAP SCREW 3/4-10 NC-2A-G SCREW (BY OTHERS)
℄ OF ANCILLARY UNIT
ESCAPE HATCH
DOOR ASSY. DWG NO 149-G1
CAPSTAN
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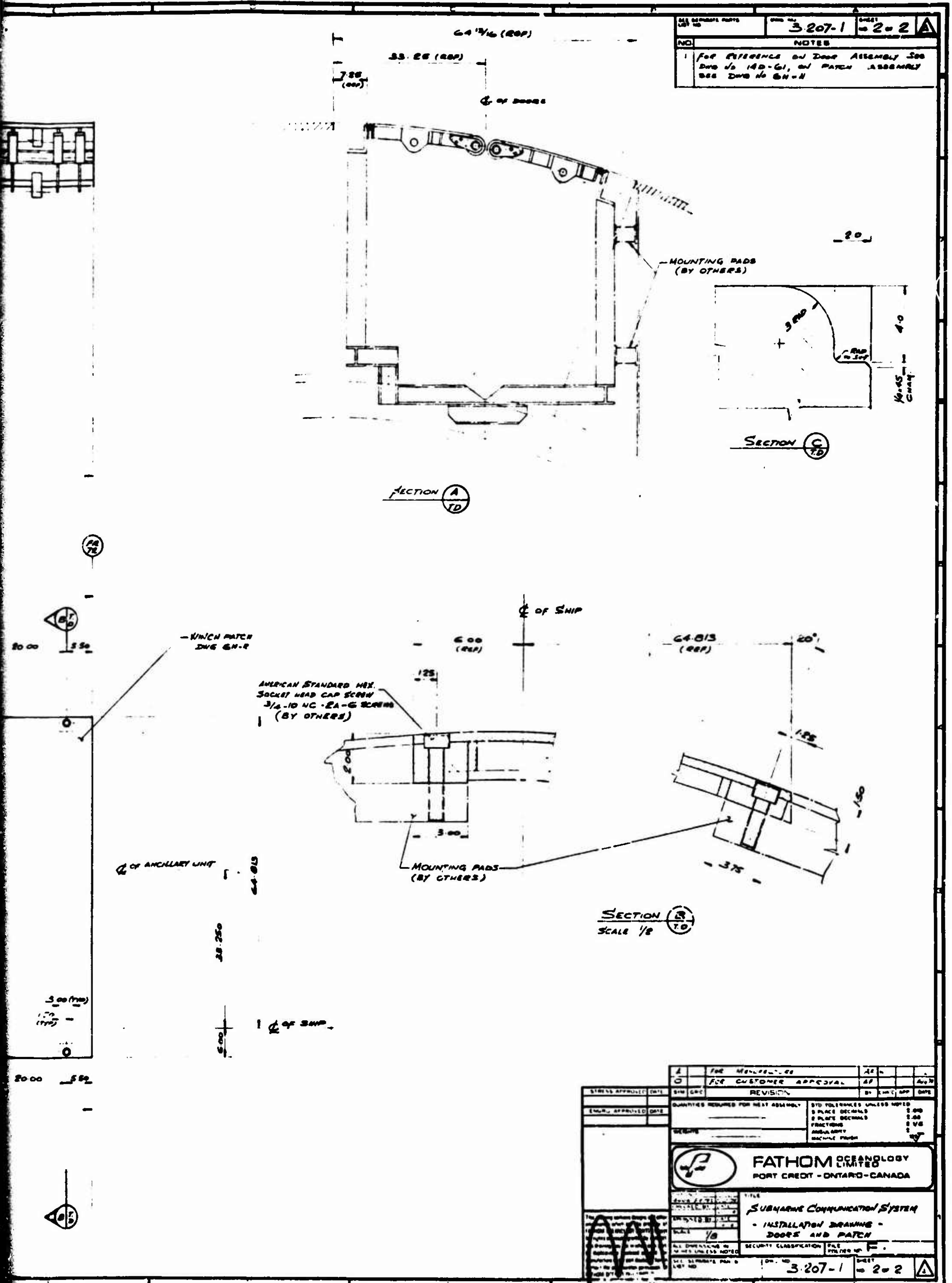
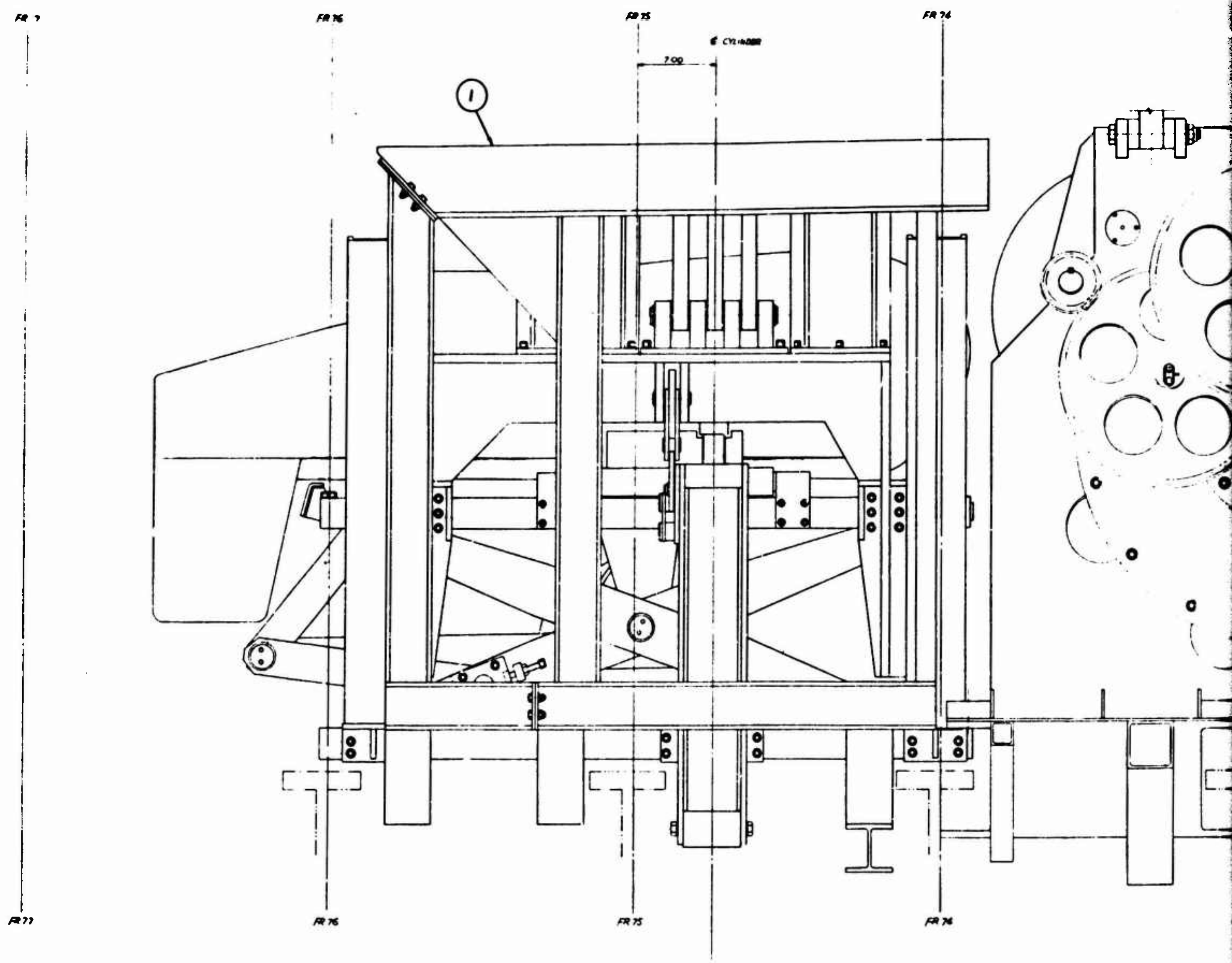

3.207-1
2 of 2
NOTES
1 FOR REFERENCE ON DOOR ASSEMBLY SEE DWG No 14D-61, ON PATCH ASSEMBLY SEE DWG No 6H-11
64 13/16 (REF)
33.26 (REF)
℄ OF DOORS
MOUNTING PADS (BY OTHERS)
SECTION C T.D
SECTION A T.D
WINCH PATCH DWG 6H-2
℄ OF SHIP
6.00 (REF)
64.813 (REF)
AMERICAN STANDARD HEX. SOCKET HEAD CAP SCREW 3/4-10 NC-2A-G SCREWS (BY OTHERS)
MOUNTING PADS (BY OTHERS)
SECTION B T.D
SCALE 1/8
℄ OF ANCILLARY UNIT
℄ OF SHIP
REVISION
FOR CUSTOMER APPROVAL
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
SUBMARINE COMMUNICATION SYSTEM
- INSTALLATION DRAWING -
DOORS AND PATCH
3.207-1
2 of 2

B

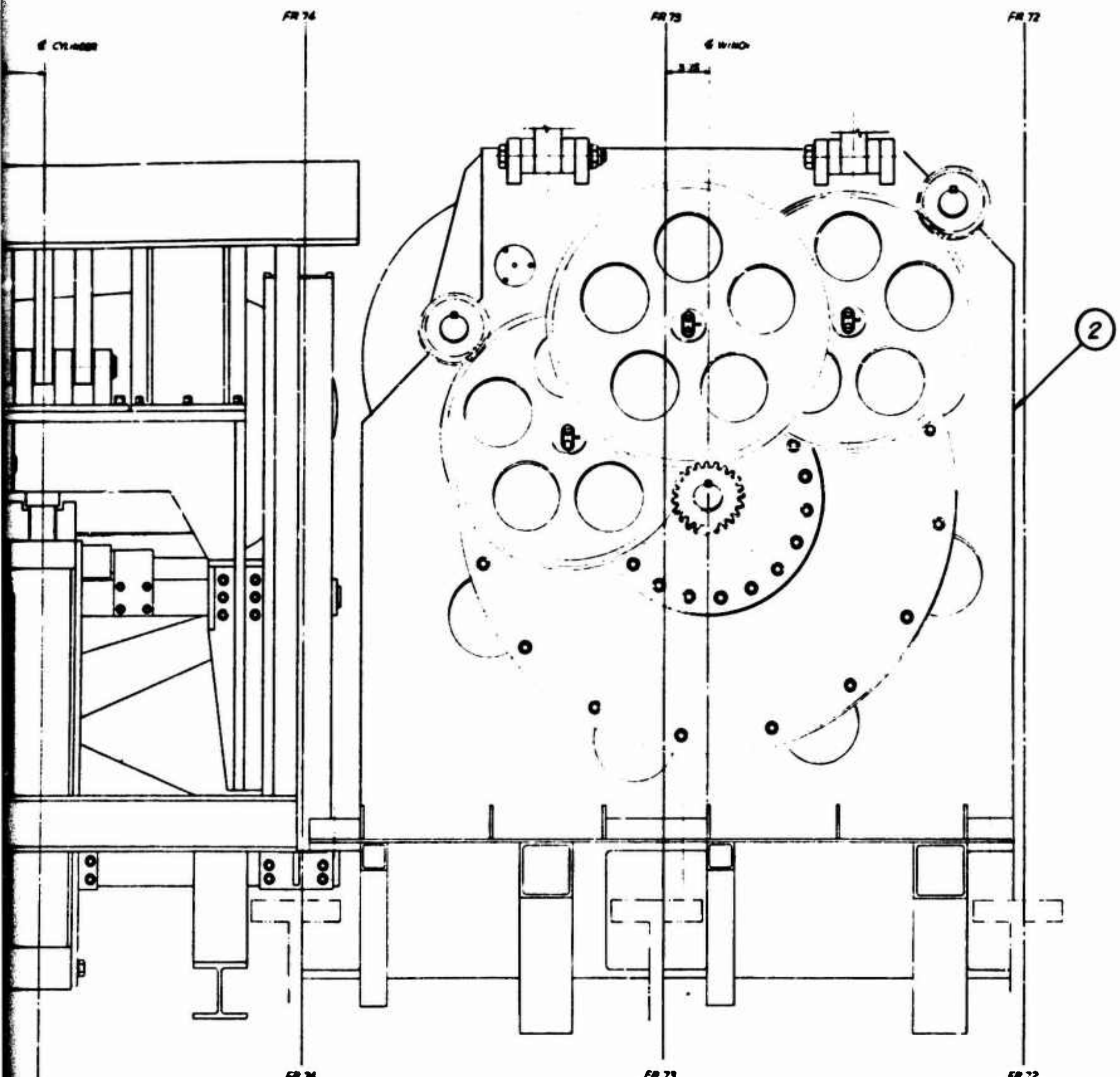
E72



A

DWG No.		SHEET	
3-207-2	3-2[illegible]7-2	[illegible] OF 4	A

NO	NOTES
1.	Limited Rights Data A.S.P.R. Clause 7-104-9. (a) Patent on Double Drum Canada [illegible] U.S.A. [illegible] (b) Patent on Lip and Latch U.S.A. [illegible] (c) Patent on Floating Roller Clutch U.S.A. [illegible]



LIMITED RIGHTS LEGEND

Contract No. .... N00014-71-[illegible] ....
Contractor: .... FATHOM OCEANOLOGY LIMITED ....
Explanation of Limited Rights [illegible] Used ....
.... NOTE 1 [illegible] ....

These portions of this technical data indicated as limited rights data shall not without the written permission of the above Contractor, be either (a) used, released or disclosed in whole or in part outside the Government, (b) used in whole or in part by the Government for manufacture, or (c) used by a party other than the Government, except for: (i) emergency repair or overhaul work only, by or for the Government, where the item or process concerned is not otherwise reasonably available to enable timely performance of the work, provided that the release or disclosure hereof outside the Government shall be made subject to a prohibition against further use, release, or disclosure; or (ii) release to a foreign government, as the interest of the United States may require, only for information or evaluation within such government or for emergency repair or overhaul work by or for such government under the conditions of (i) above. This legend, together with the indications of the portions of this data which are subject to such limitations shall be included on any reproduction hereof which includes any part of the portions subject to such limitations.

SYM	ZONE	REVISION	BY	CHK'D	APP.	DATE
A	ALL	FOR MANUFACTURE	AF	AF	[illegible]	[illegible]
C		[illegible] APPROVAL	WL			

STRESS APPROVED / DATE

ENG'G APPROVED / DATE

QUANTITIES REQUIRED FOR NEXT ASSEMBLY: SEE SHEET 1

WEIGHT: SEE SHEET 1

STD TOLERANCES UNLESS NOTED	
3 PLACE DECIMAL	± .010
2 PLACE DECIMALS	± .03
FRACTIONS	± 1/16
ANGULARITY	±
MACHINE FINISH	

FATHOM OCEANOLOGY LIMITED
PORT CREDIT – ONTARIO – CANADA

TITLE: SUBMARINE COMMUNICATION SYSTEM — GENERAL ARANGEMENT SIDE VIEW

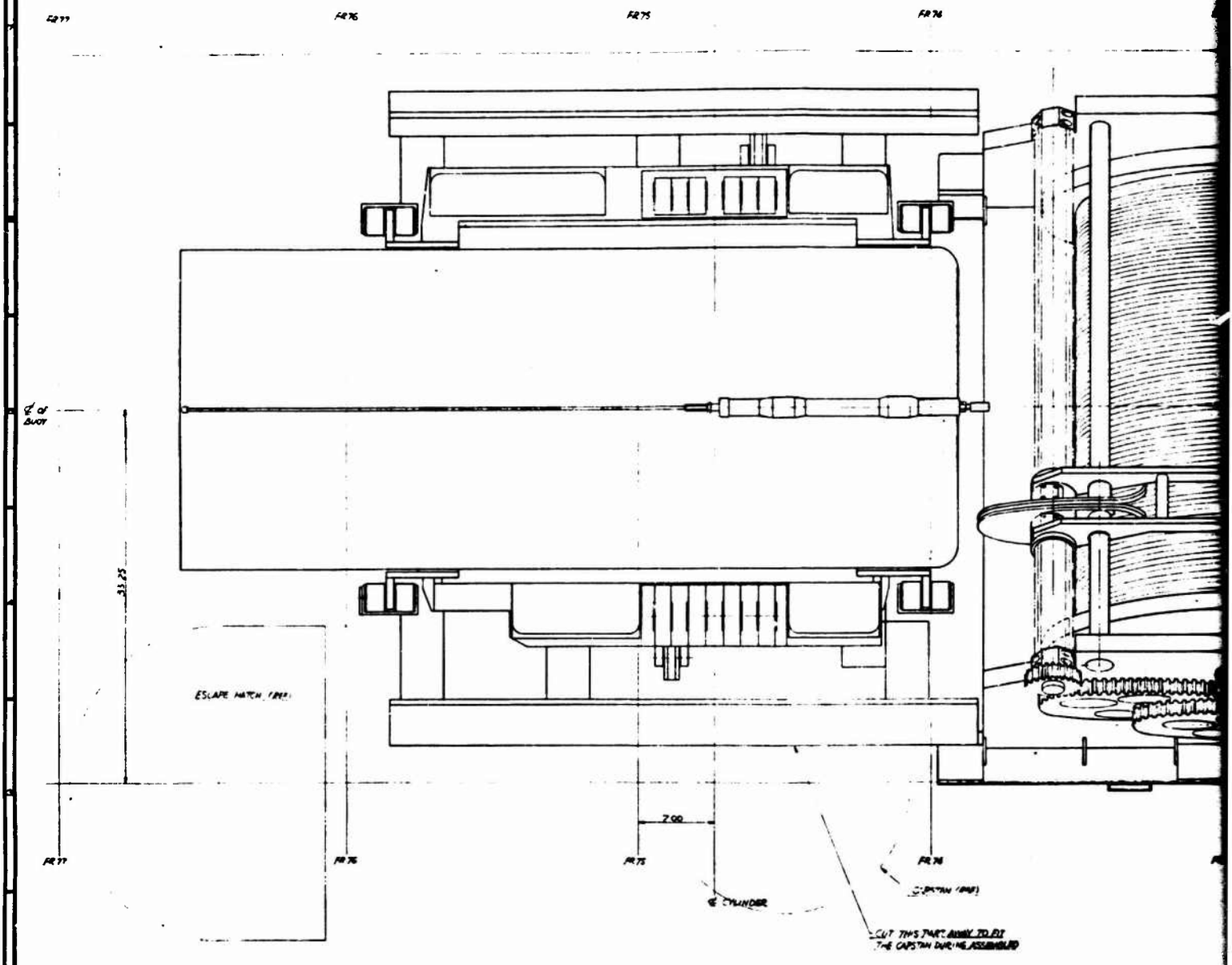
SCALE: 1/4

FILE FOLDER NO: E-

DWG No. [illegible]-2 [illegible]-2 SHEET NO 1 OF 4 A

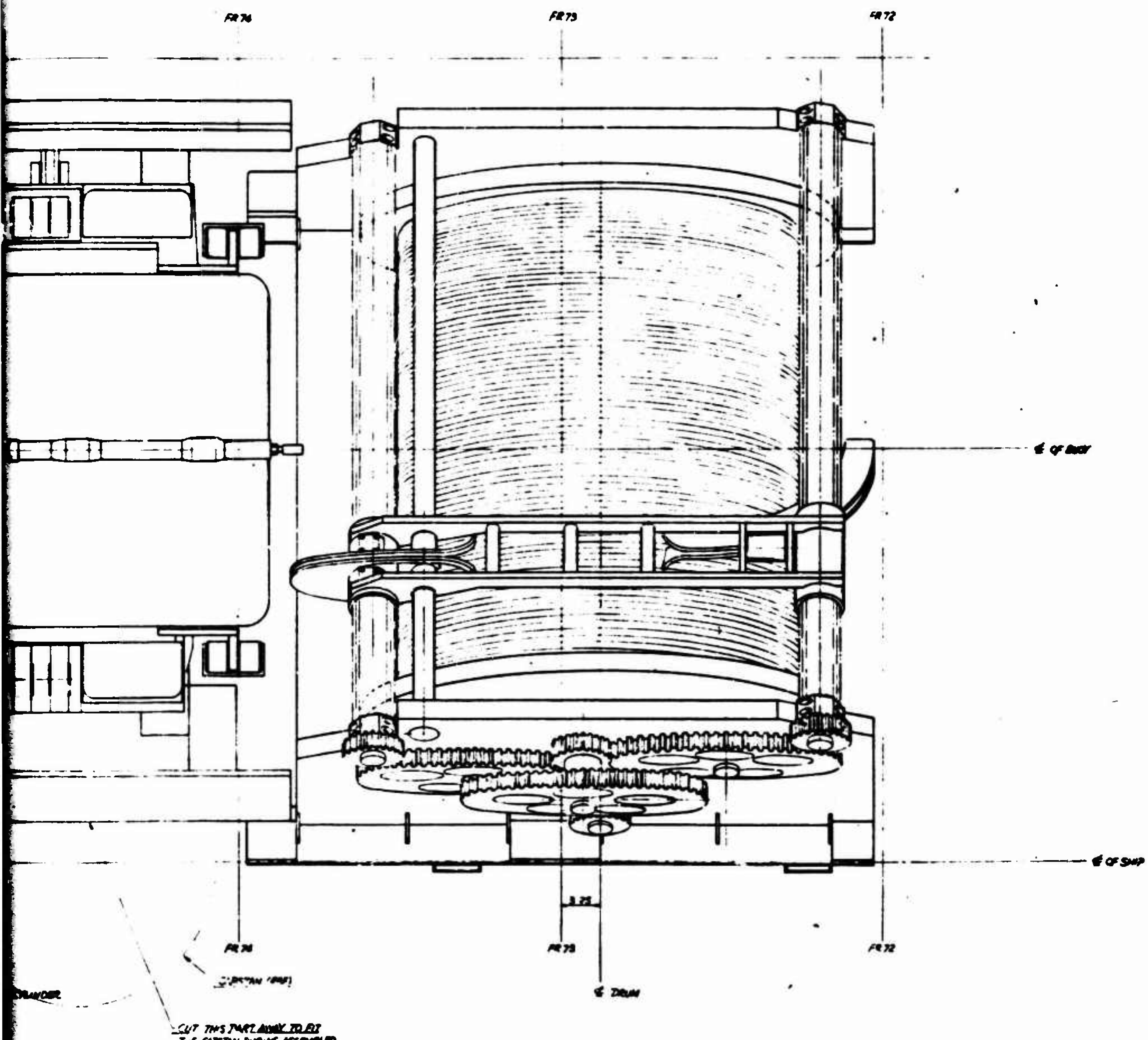
B

E8[illegible]


FR77
FR76
FR75
FR76
℄ of BUOY
33.25
ESCAPE HATCH (FWD)
7.00
FR77
FR76
FR75
FR76
℄ CYLINDER
CAPSTAN (FWD)
CUT THIS PART AWAY TO FIT THE CAPSTAN DURING ASSEMBLY

3 207-2 | 3 207-2 | 2 of 4

NOTES



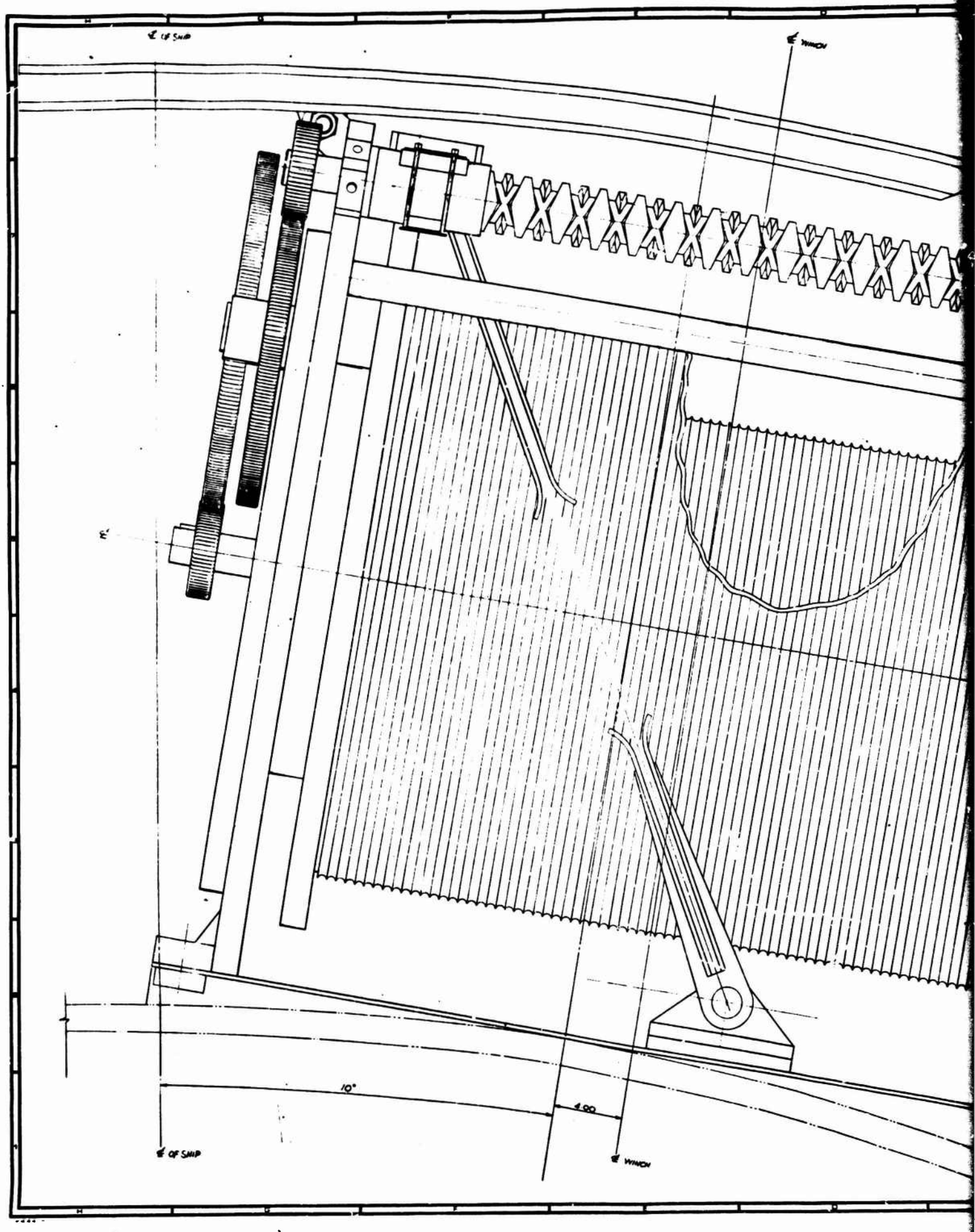
FOR MANUFACTURE
FOR CUSTOMER APPROVAL

REVISION

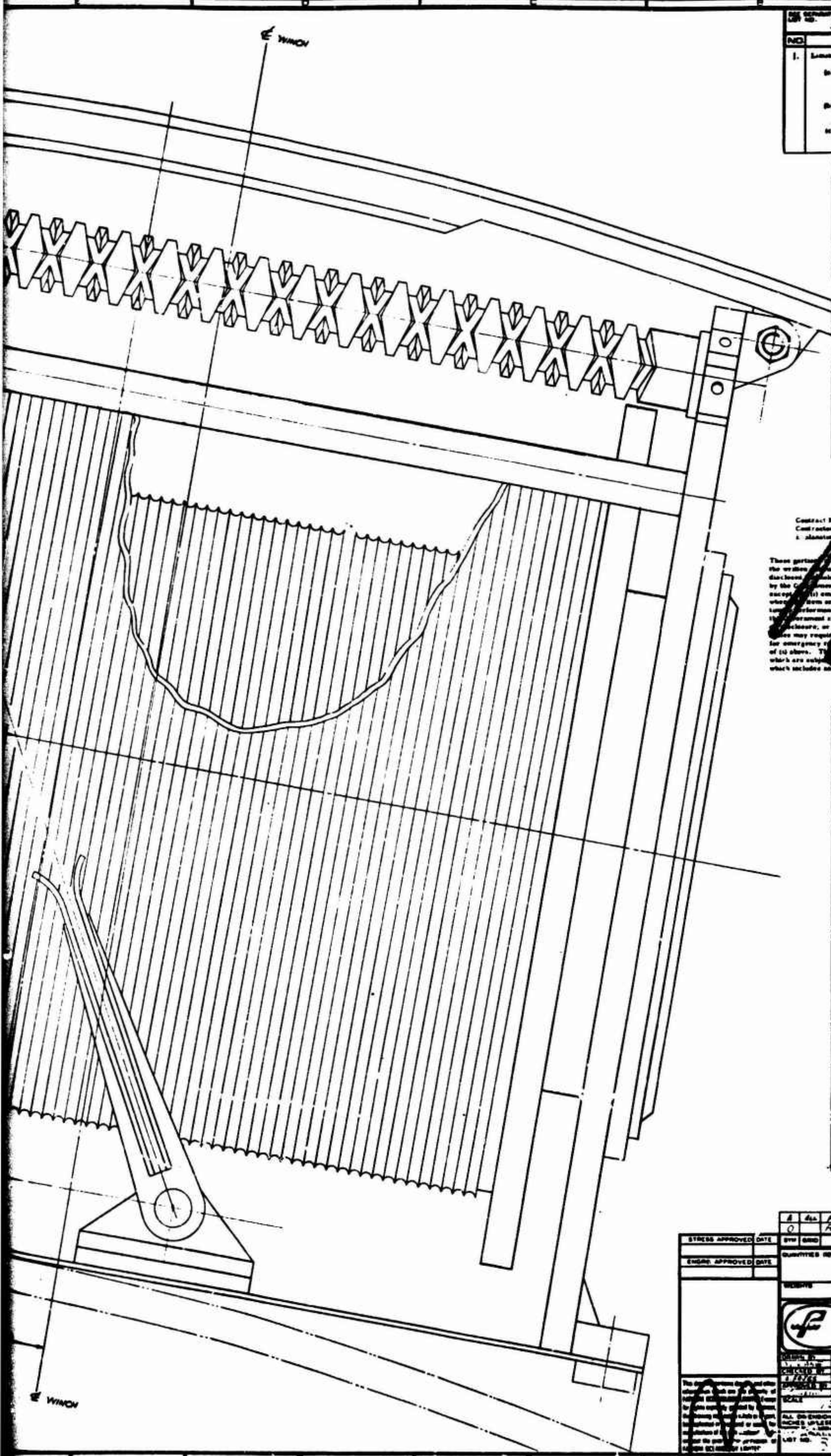
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

SUBMARINE COMMUNICATION SYSTEM — GENERAL ARRANGEMENT PLAN VIEW

3 207-2 | 2 of 4



A



SEE SEPARATE PARTS LIST NO.	DWG. NO.	SHEET NO.
3 207-2	3 207-2	3 OF 4

NO.	NOTES
1.	Limited rights data A.S.P.R. Clause 7-[illegible] (a) Patent on Double Drum, Canada [illegible], U.S.A. [illegible] (b) Patent on Lip and Latch, U.S.A. [illegible] (c) Patent on Floating Roller Cluster, U.S.A. [illegible]

[redacted]

SYM	GRID	REVISION	BY	CHK'D	APR	
A	4	FOR MANUFACTURE	AF	AF	JH	
O		FOR CUSTOMER APPROVAL	WL			

STRESS APPROVED / DATE

ENGRG. APPROVED / DATE

QUANTITIES REQUIRED FOR NEXT ASSEMBLY

WEIGHTS

STD. TOLERANCES UNLESS NOTED
3 PLACE DECIMALS ±
2 PLACE DECIMALS ±
FRACTIONS ± 1/16
ANGULARITY ±
MACHINE FINISH

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

DRAWN BY / DATE
CHECKED BY / DATE
APPROVED BY / DATE
SCALE 1/2

TITLE
SUBMARINE COMMUNICATION SYSTEM — GENERAL ARANGEMENT END VIEW

ALL DIMENSIONS IN INCHES UNLESS NOTED

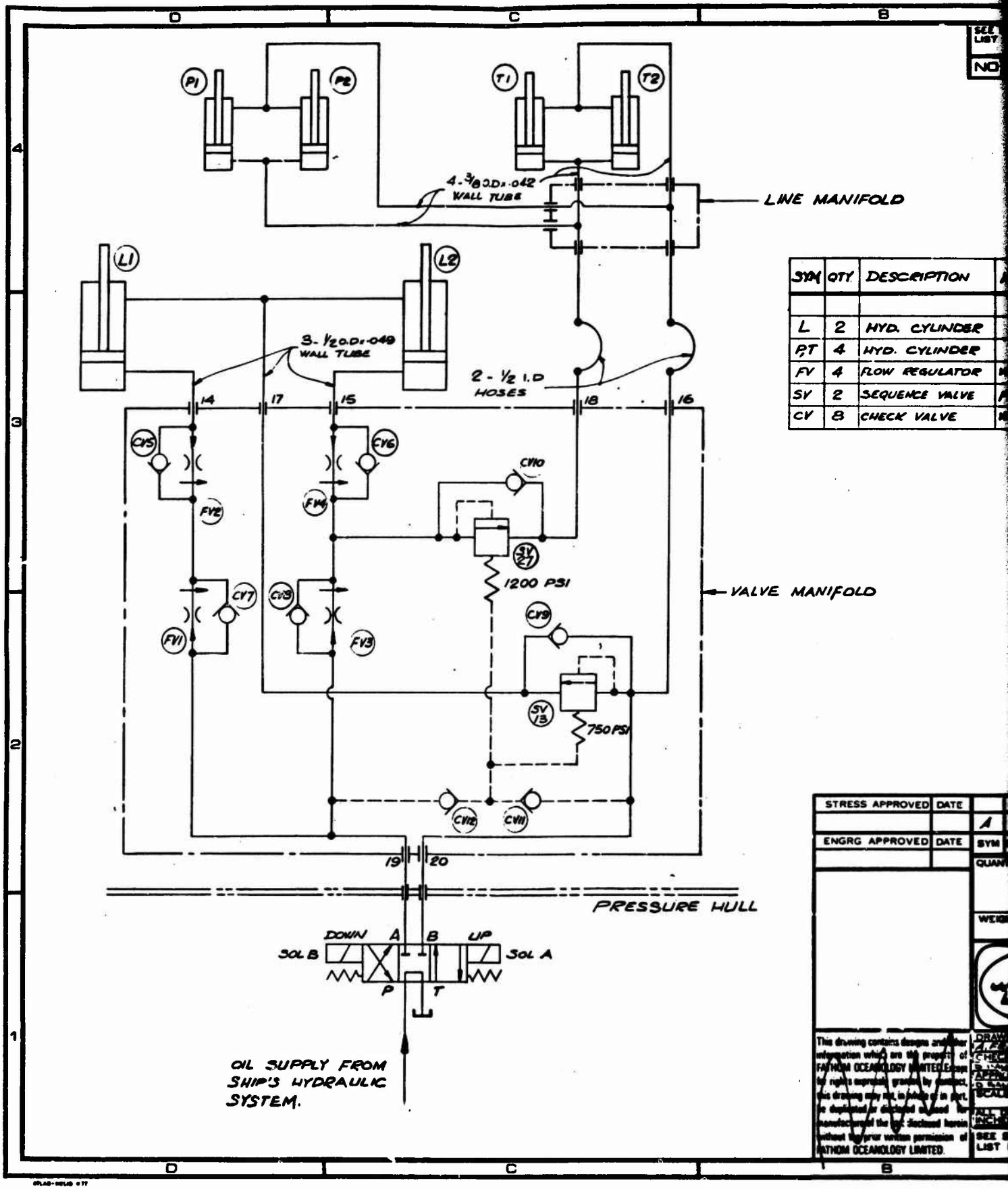
SECURITY CLASSIFICATION

FILE FOLDER NO. E-

[redacted]

SEE SEPARATE PARTS LIST NO.	DWG. NO.	SHEET NO.
3 207	3 207-2	3 OF 4

B

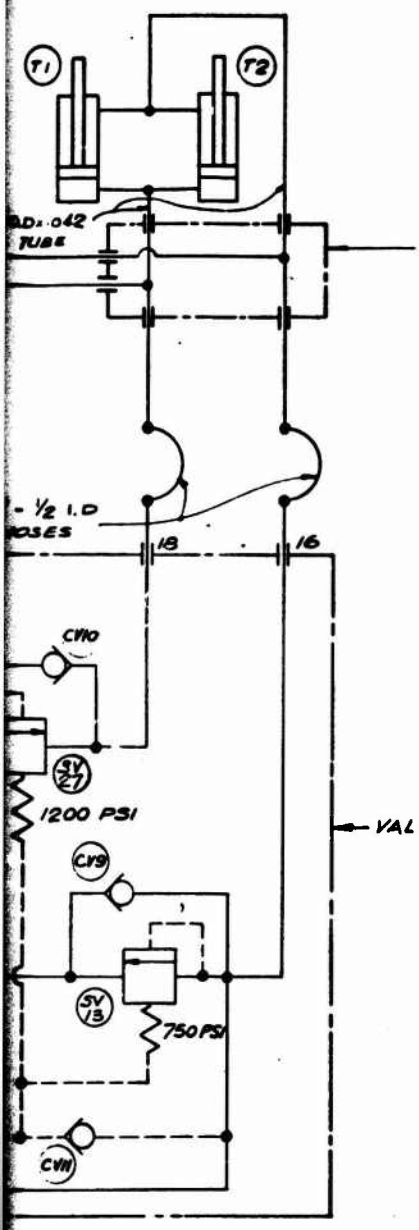


SYM	QTY.	DESCRIPTION
L	2	HYD. CYLINDER
PT	4	HYD. CYLINDER
FV	4	FLOW REGULATOR
SV	2	SEQUENCE VALVE
CV	8	CHECK VALVE

STRESS APPROVED	DATE
ENGRG APPROVED	DATE

SEE SEPARATE PARTS LIST NO. —	DWG. NO. 3.207-2	SHEET NO. 4 OF 4	A

NO	NOTES



SYM	QTY.	DESCRIPTION	MANUFACTURER	MODEL NO.	REMARKS
L	2	HYD. CYLINDER		FATHOM# 14D-24	3/4-16 SAE, 26 STROKE
P,T	4	HYD. CYLINDER		FATHOM# 14D-34	3/16-18 SAE, 1 STROKE
FV	4	FLOW REGULATOR	WATERMAN	FATHOM# 18D-68-502	1 1/8-18 UNF THREAD
SV	2	SEQUENCE VALVE	FLUID CONTROLS	# 1SA10-F-305	1-14 UNS
CV	8	CHECK VALVE	WATERMAN	SK 843	1 1/16-12 UNF

STRESS APPROVED	DATE							
		A	FOR MANUFACTURE		A.F			Sept 11/74
ENGRG APPROVED	DATE	SYM	REVISION		BY	CHD	APR	DATE
		QUANTITY PER NEXT ASSY.		STD. TOLERANCES UNLESS NOTED				
				3 PLACE DECIMALS			±.010	
				2 PLACE DECIMALS			±.03	
		WEIGHTS		FRACTIONS			± V16	
				ANGULARITY			±	
				MACHINE FINISH			125	

FATHOM OCEANOLOGY LTD
PORT CREDIT - ONTARIO - CANADA

DRAWN BY:	DATE
A. FETES	Sept 74
CHECKED BY:	DATE
APPROVED BY:	DATE
SCALE: —	
ALL DIMENSIONS IN INCHES UNLESS NOTED	

TITLE
SUBMARINE COMMUNICATION SYSTEM
HYDRAULIC SCHEMATIC

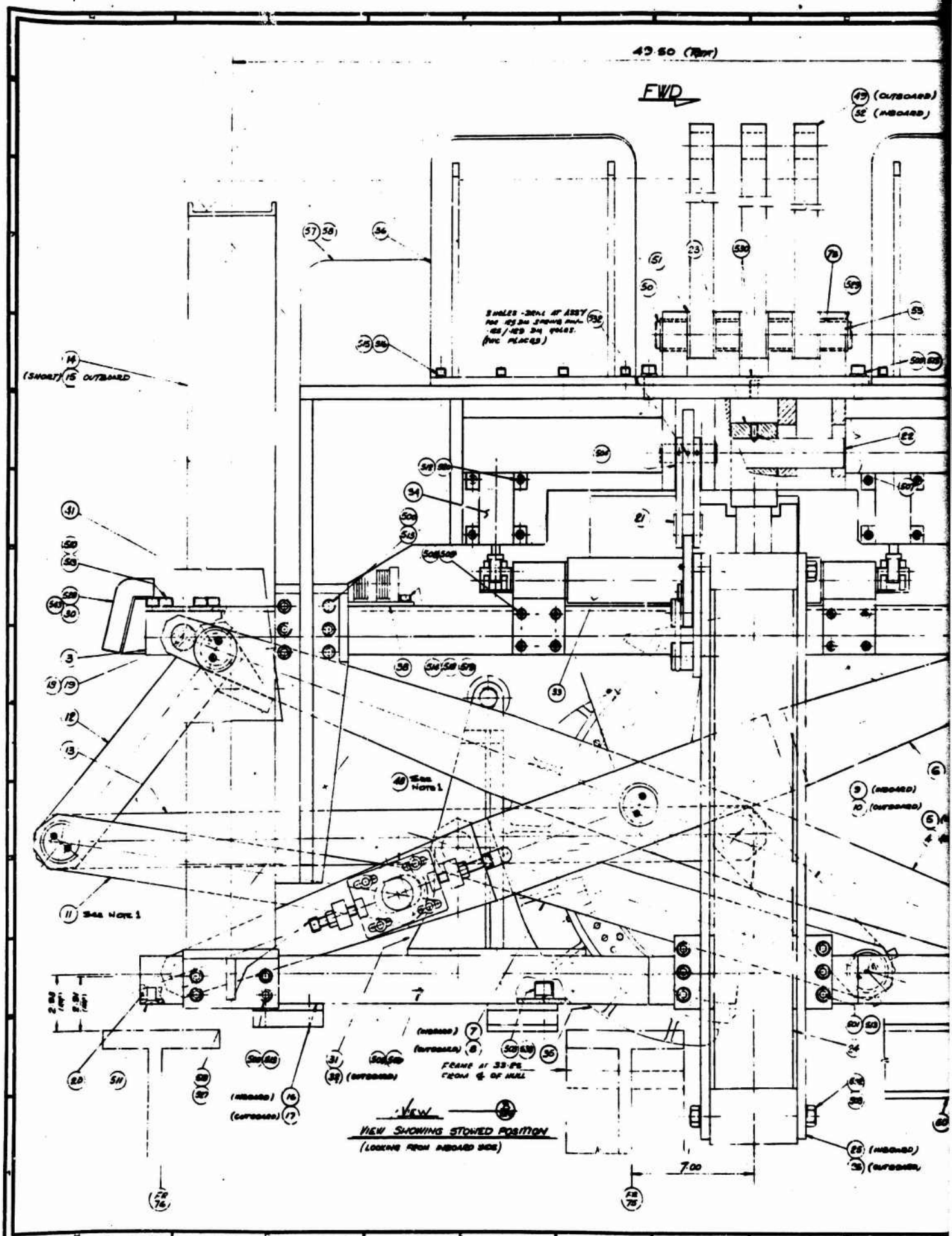
SECURITY CLASSIFICATION — FILE FOLDER NO. C-

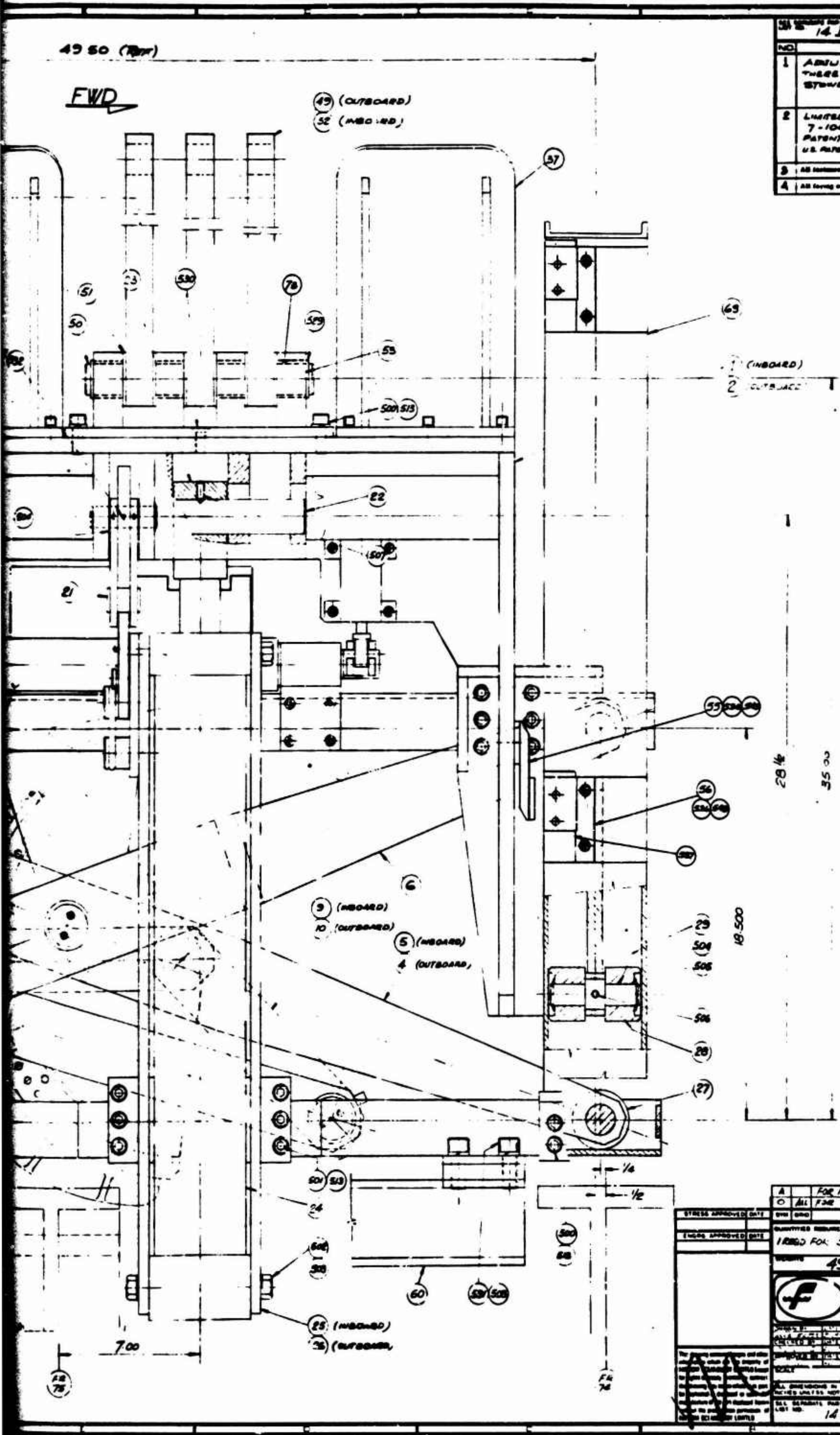
SEE SEPARATE PARTS LIST NO. —

DWG. NO. 3.207-2

SHEET NO. 4 OF 4 A

B


FWD
(OUTBOARD)
(INBOARD)
(SHORT) OUTBOARD
(INBOARD)
(OUTBOARD)
(INBOARD)
(OUTBOARD)
(INBOARD)
(OUTBOARD)
(INBOARD)
(OUTBOARD)
FRAME AT 33·PS FROM ℄ OF HULL
VIEW
VIEW SHOWING STOWED POSITION
(LOOKING FROM INBOARD SIDE)
7.00
FR 76
FR 75



SEE SEPARATE PARTS LIST NO.	DWG NO.	SHEET
14 D	14D	1 of 7

NO.	NOTES
1	ADJUST ECCENTRIC PIN, THAT THERE IS NO CABLE CHANGE IN STOWED/RAISED CONDITION
2	LIMITED RIGHTS DATA A.S.P.R. CLAUSE 7-104-9 PATENT ON FLOATING ROLLER CLUSTER U.S. PATENT NO 3702319
3	All fasteners to be treated with Loctite ...
4	All faying surfaces to have Tectyl ... applied to them.

		REVISION	BY	CHK'D	APR	DATE
A		FOR MANUFACTURE	AF			
O	ALL	FOR CUSTOMER APPROVAL	AF			

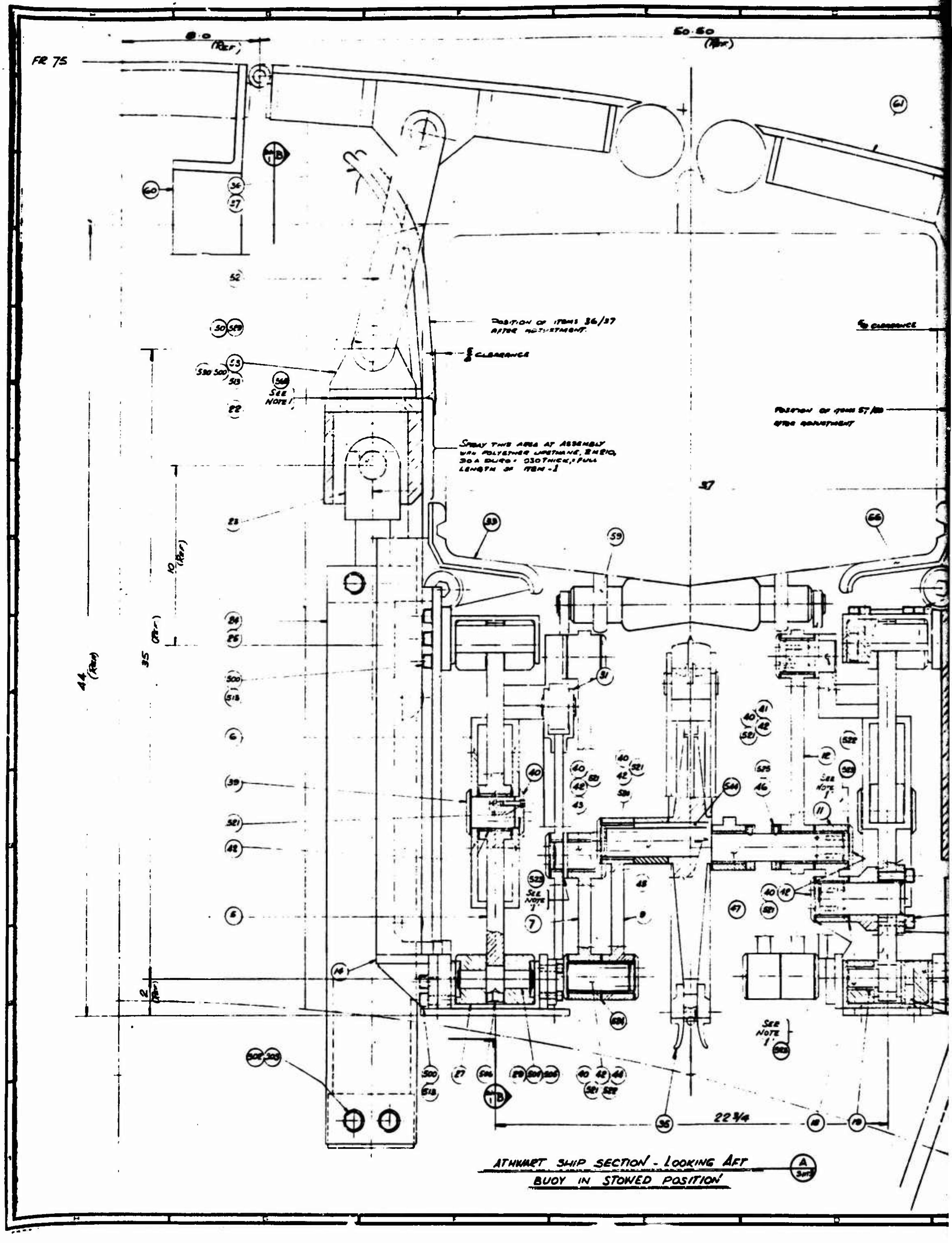
QUANTITIES REQUIRED FOR NEXT ASSEMBLY: 1 REQD FOR 3 ...

WEIGHT: 4912.9 LBS

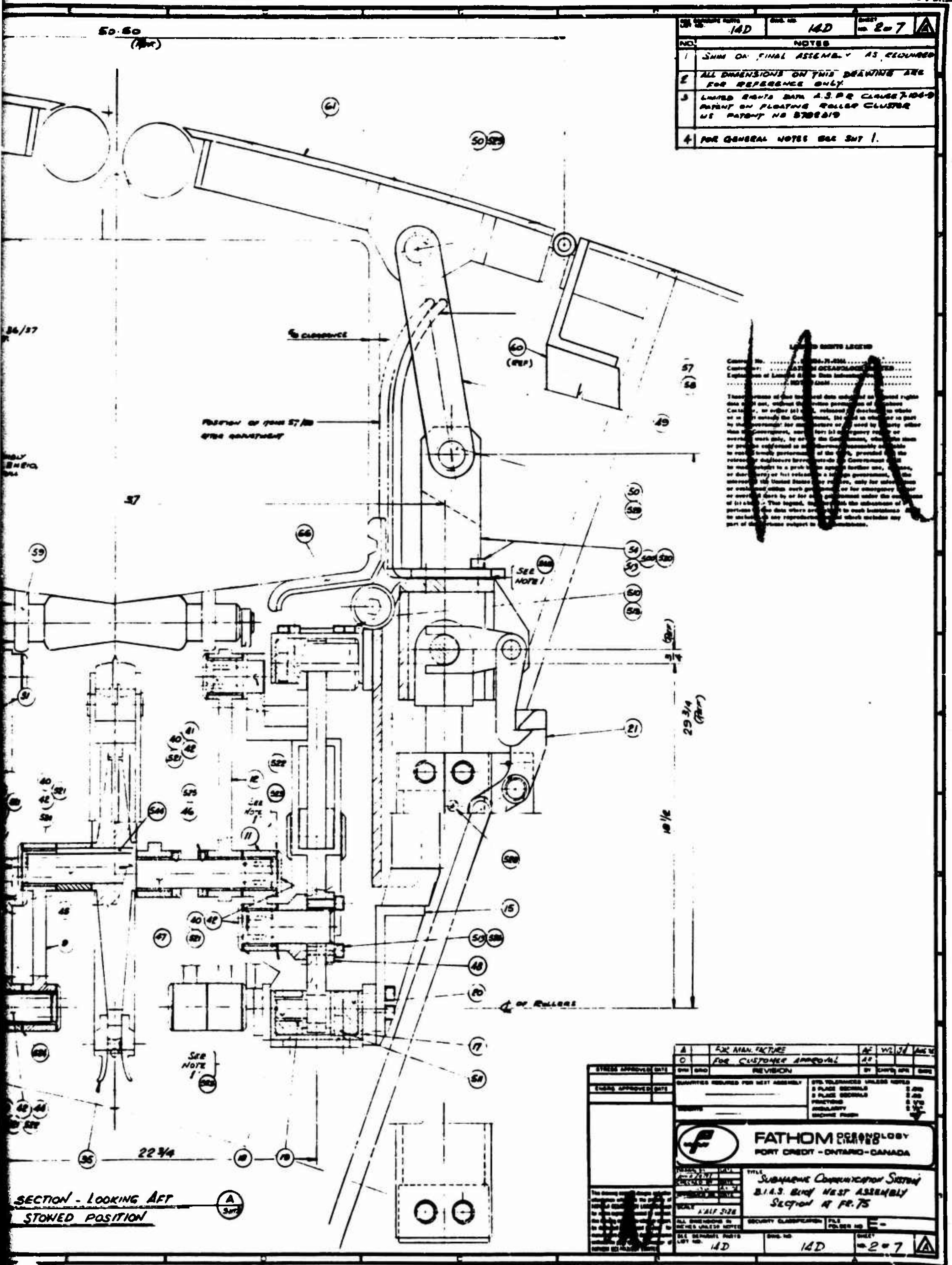
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

TITLE: SUBMARINE COMMUNICATION SYSTEM B.I.A.S. BUOY NEST ASSEMBLY INBOARD SIDE - STOW & TOW MODE

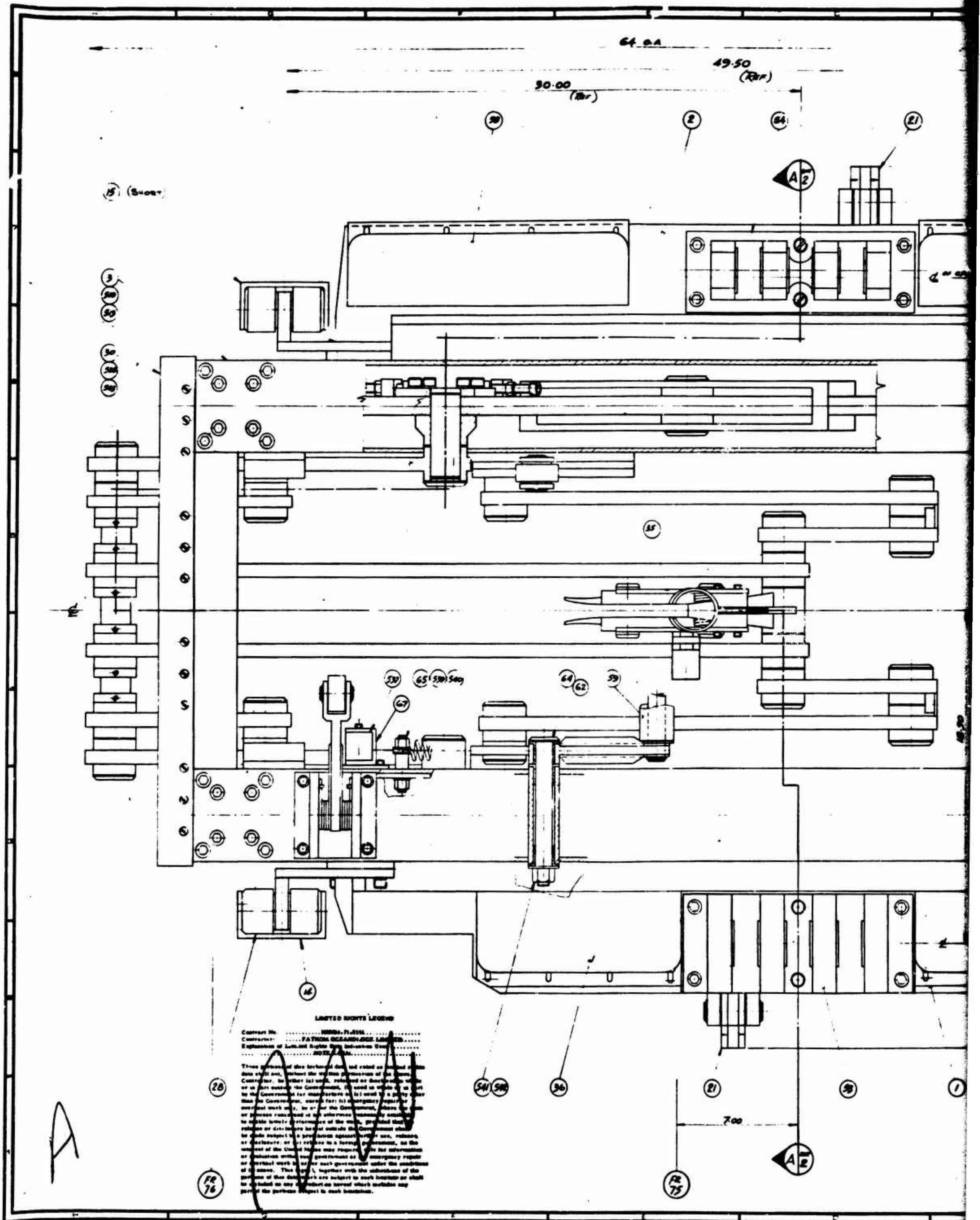
SEE SEPARATE PARTS LIST NO. 14D — DWG NO. 14D — SHEET 1 of 7



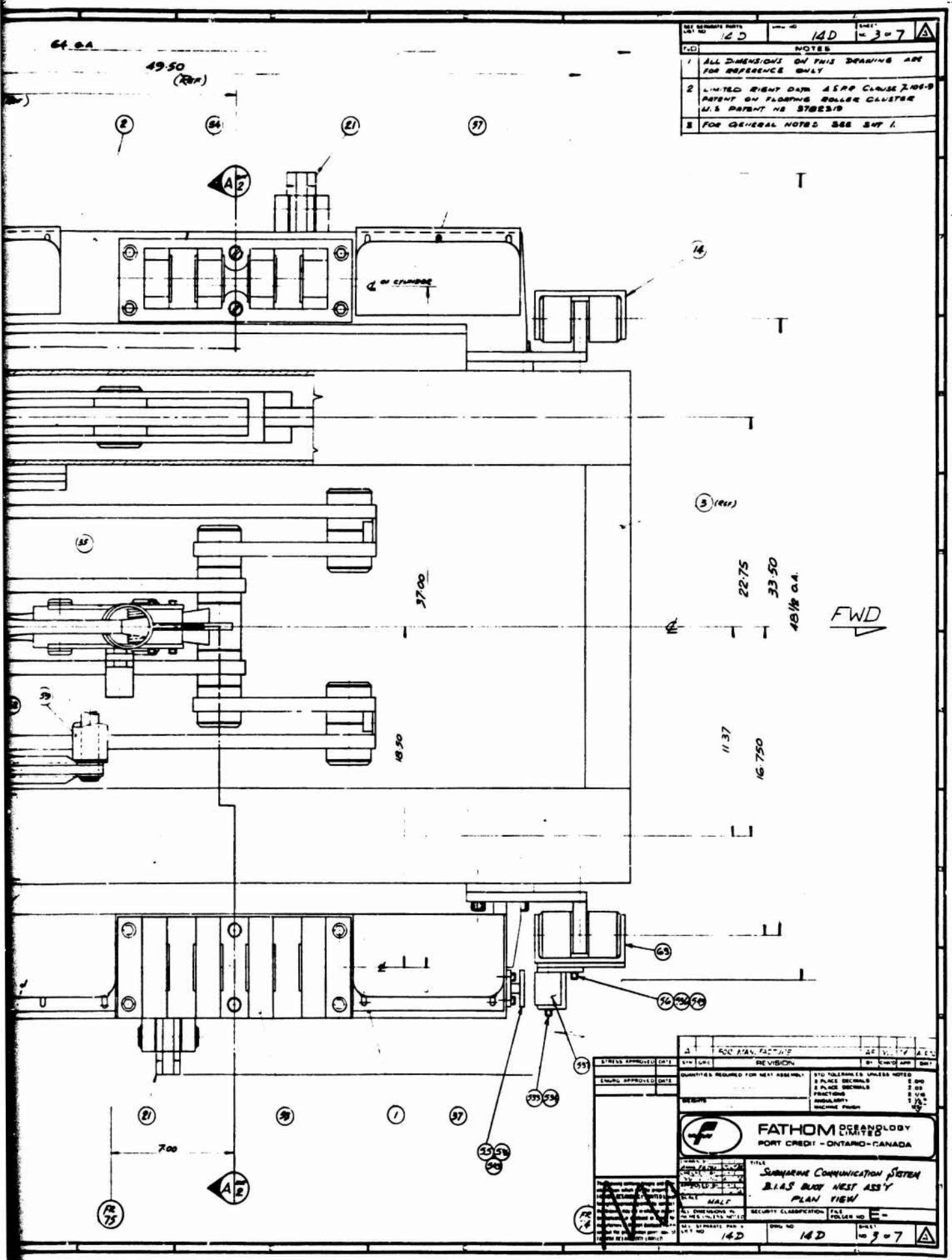
ATHWART SHIP SECTION - LOOKING AFT
BUOY IN STOWED POSITION


NOTES
1 SHIM ON FINAL ASSEMBLY AS REQUIRED
2 ALL DIMENSIONS ON THIS DRAWING ARE FOR REFERENCE ONLY.
4 FOR GENERAL NOTES SEE SHT 1.
SECTION - LOOKING AFT
STOWED POSITION
22 3/4
29 3/4 (REF)
10 1/2
SEE NOTE 1
A FOR MANUFACTURE
0 FOR CUSTOMER APPROVAL
REVISION
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
SUBMARINE COMMUNICATION SYSTEM
B.I.A.S. BUOY NEST ASSEMBLY
SECTION AT FR. 75
HALF SIZE
14D
14D
2 of 7

B



64 O.A
49.50 (REF)
30.00 (REF)
15 (SHORT)
A 2
7.00
FR 76
FR 75
LIMITED RIGHTS LEGEND
FATHOM OCEANOLOGY LIMITED



SEE SEPARATE PARTS LIST NO	DRG NO	SHEET
14D	14D	NO 3 OF 7

NOTES

1. ALL DIMENSIONS ON THIS DRAWING ARE FOR REFERENCE ONLY
2. LIMITED RIGHT DATA A.S.P.R. CLAUSE 7-104-9 PATENT ON FLOATING ROLLER CLUSTER U.S. PATENT NO 3782319
3. FOR GENERAL NOTES SEE SHT 1.

NO	REVISION	BY	CHKD	APP	DATE

STD TOLERANCES UNLESS NOTED
2 PLACE DECIMALS ± .010
3 PLACE DECIMALS ± .03
FRACTIONS ± 1/16
ANGULARITY 1°/4"
MACHINE FINISH

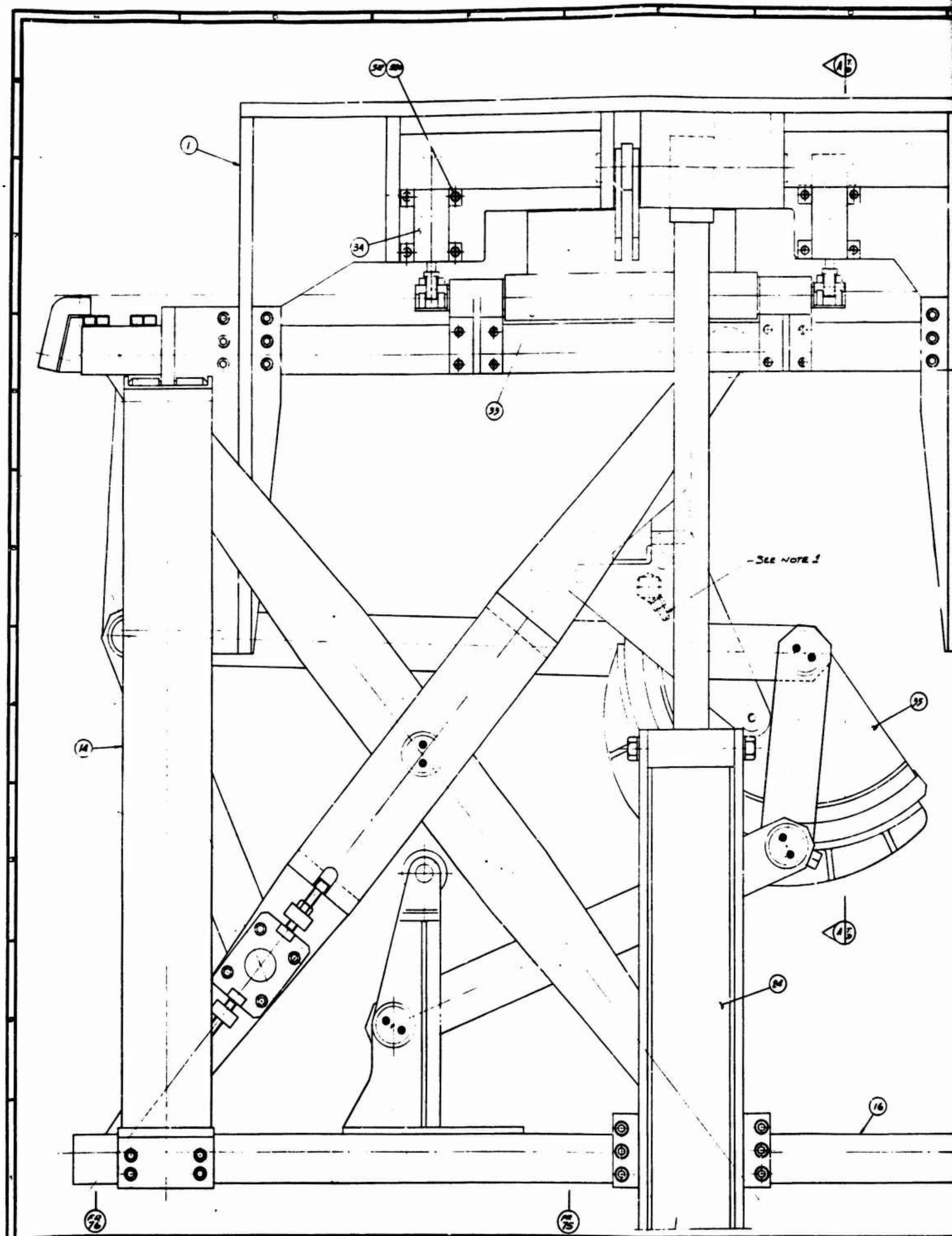
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

TITLE
SUBMARINE COMMUNICATION SYSTEM
B.I.A.S. BUOY NEST ASS'Y
PLAN VIEW

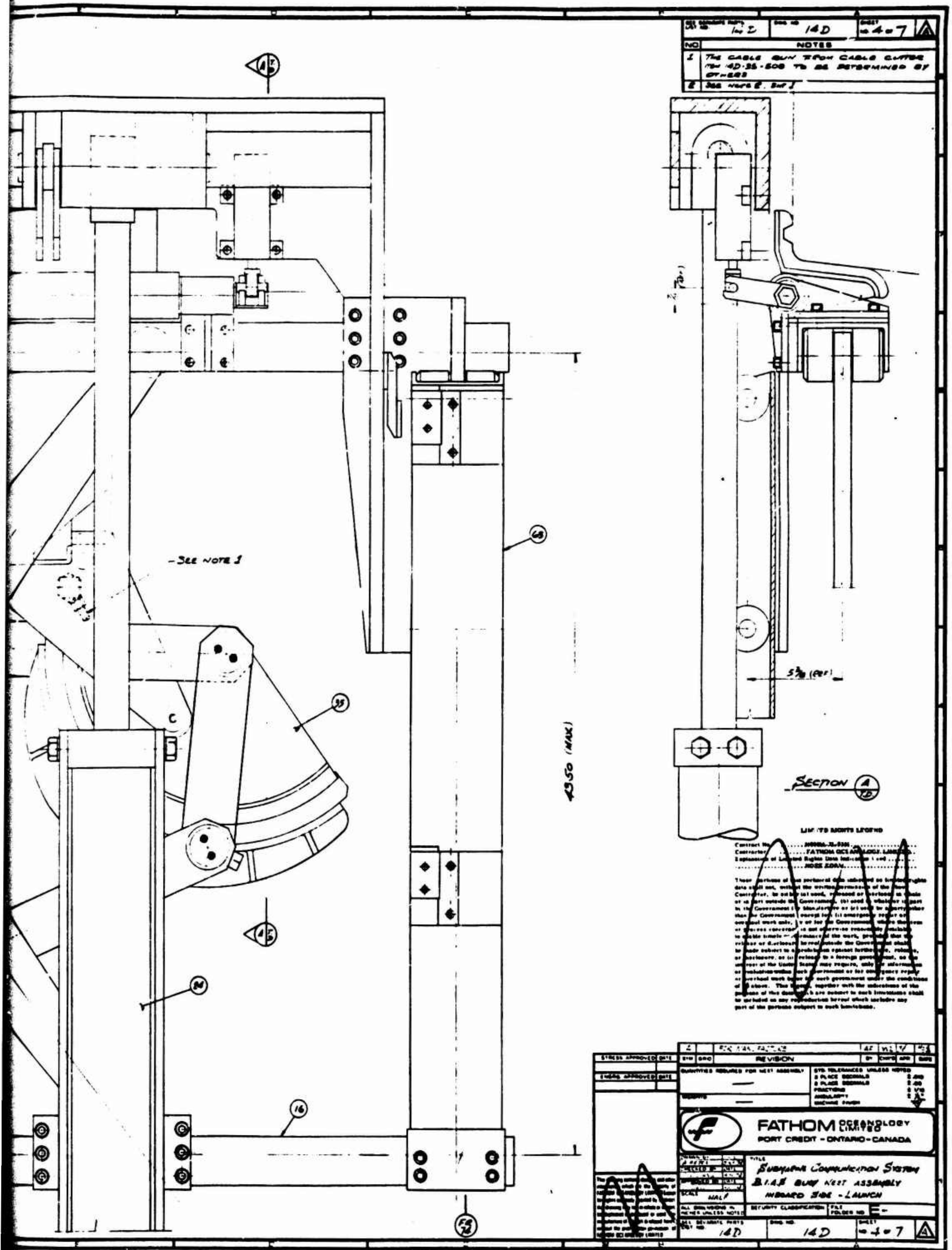
SCALE HALF
SECURITY CLASSIFICATION
FILE FOLDER NO

SEE SEPARATE PARTS LIST NO	DRG NO	SHEET
14D	14D	NO 3 OF 7

B

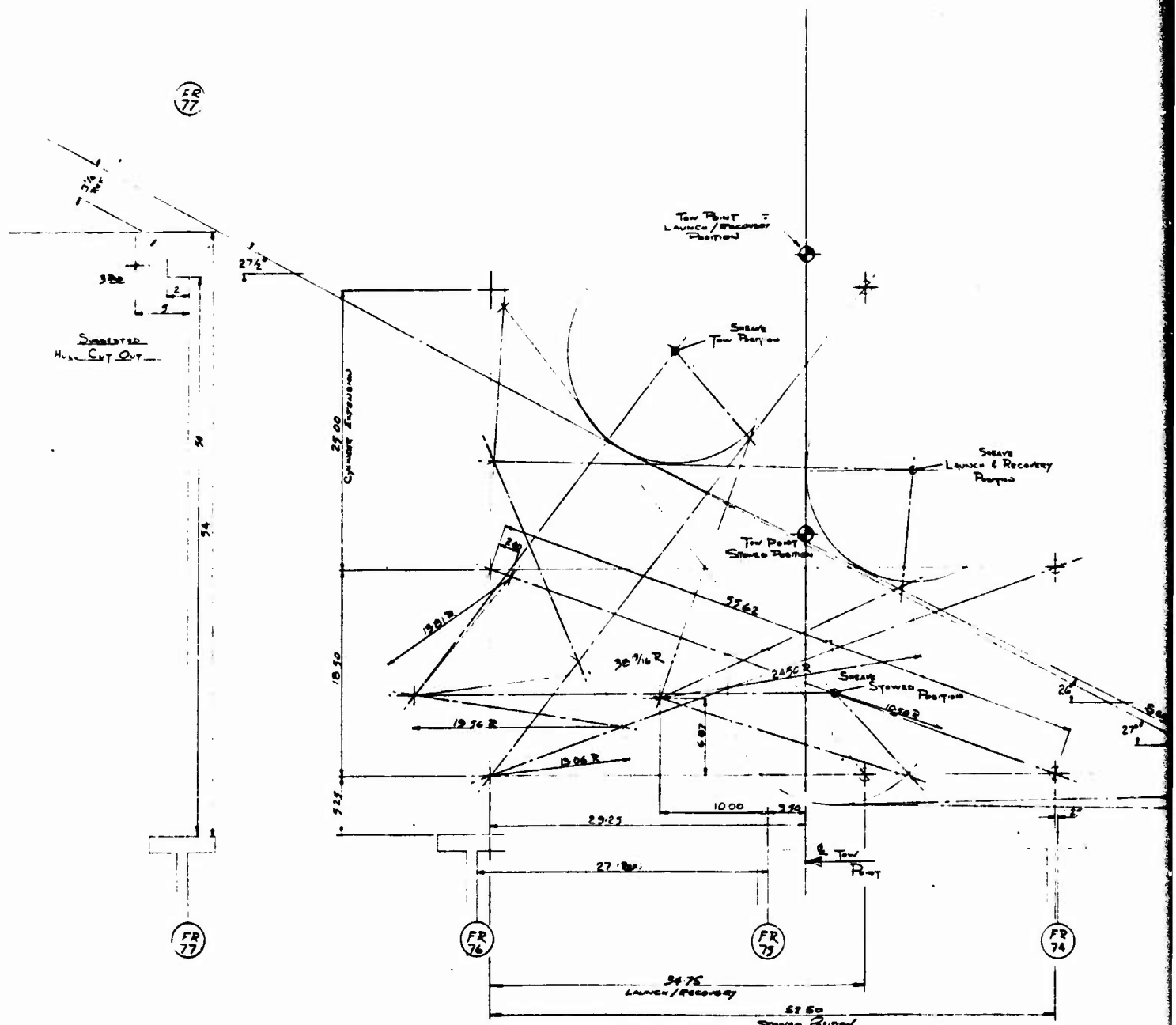


A


14D
SHEET 4 of 7
NOTES
1 The cable run from cable cutter item 4D-35-508 to be determined by others
2 See note 2, sht 1
- See note 1
68
35
84
16
4350 (MAX)
SECTION A
5⅜ (REF)
REVISION
QUANTITIES REQUIRED FOR NEXT ASSEMBLY
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
Submarine Communication System
B.1.4.8 Buoy Nest Assembly
Inboard Side - Launch
SCALE HALF
SECURITY CLASSIFICATION
14D

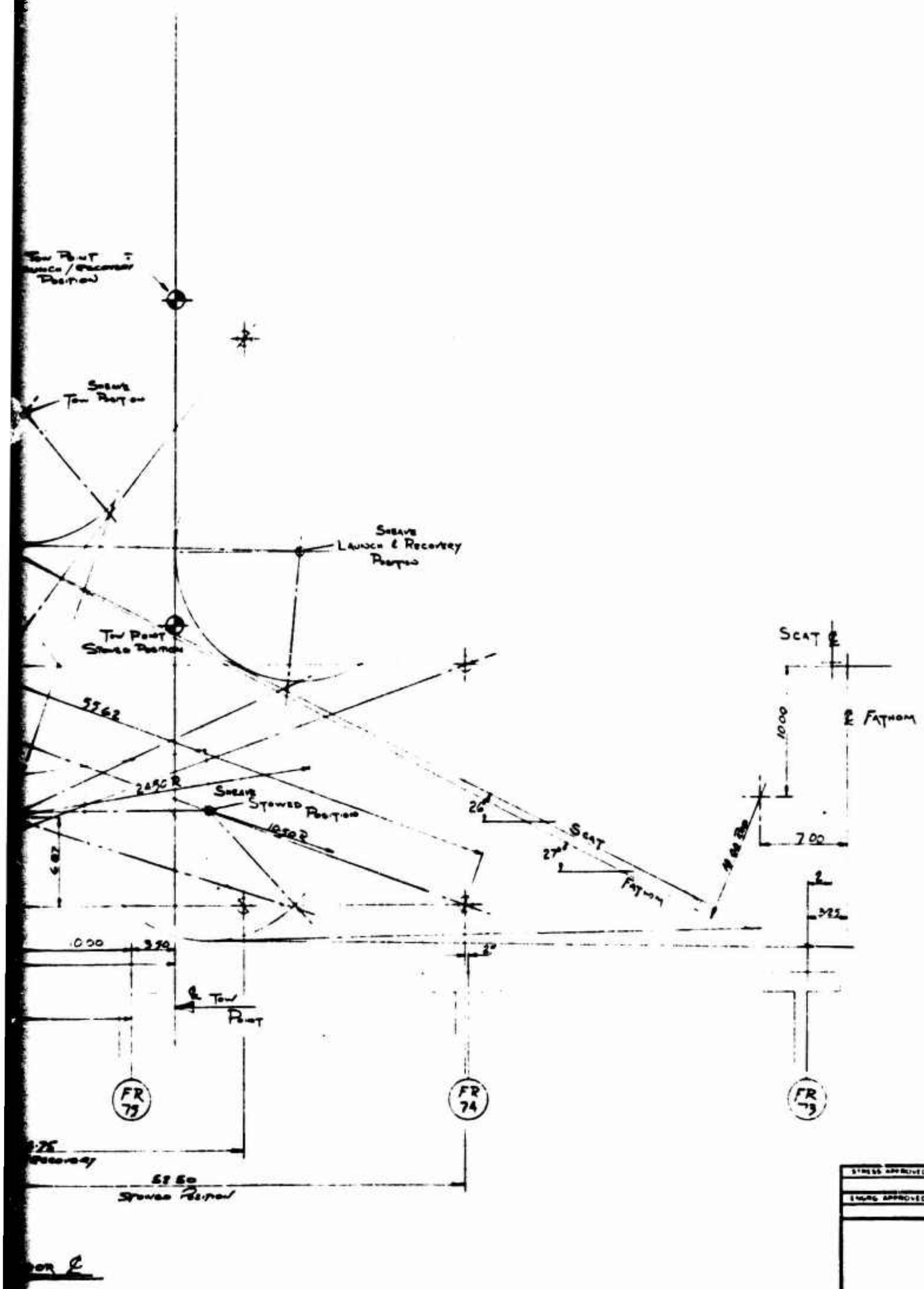
B

155



SECTION AT DOOR ℄

NO	NOTES
1	LIMITED RIGHT DATA ASPR Clause 7-104-9 PATENT ON FLOATING ROLLER CLUSTER US PATENT No 3708810



REVISION
A — FOR MANUFACTURE
— FOR CUSTOMER APPROVAL

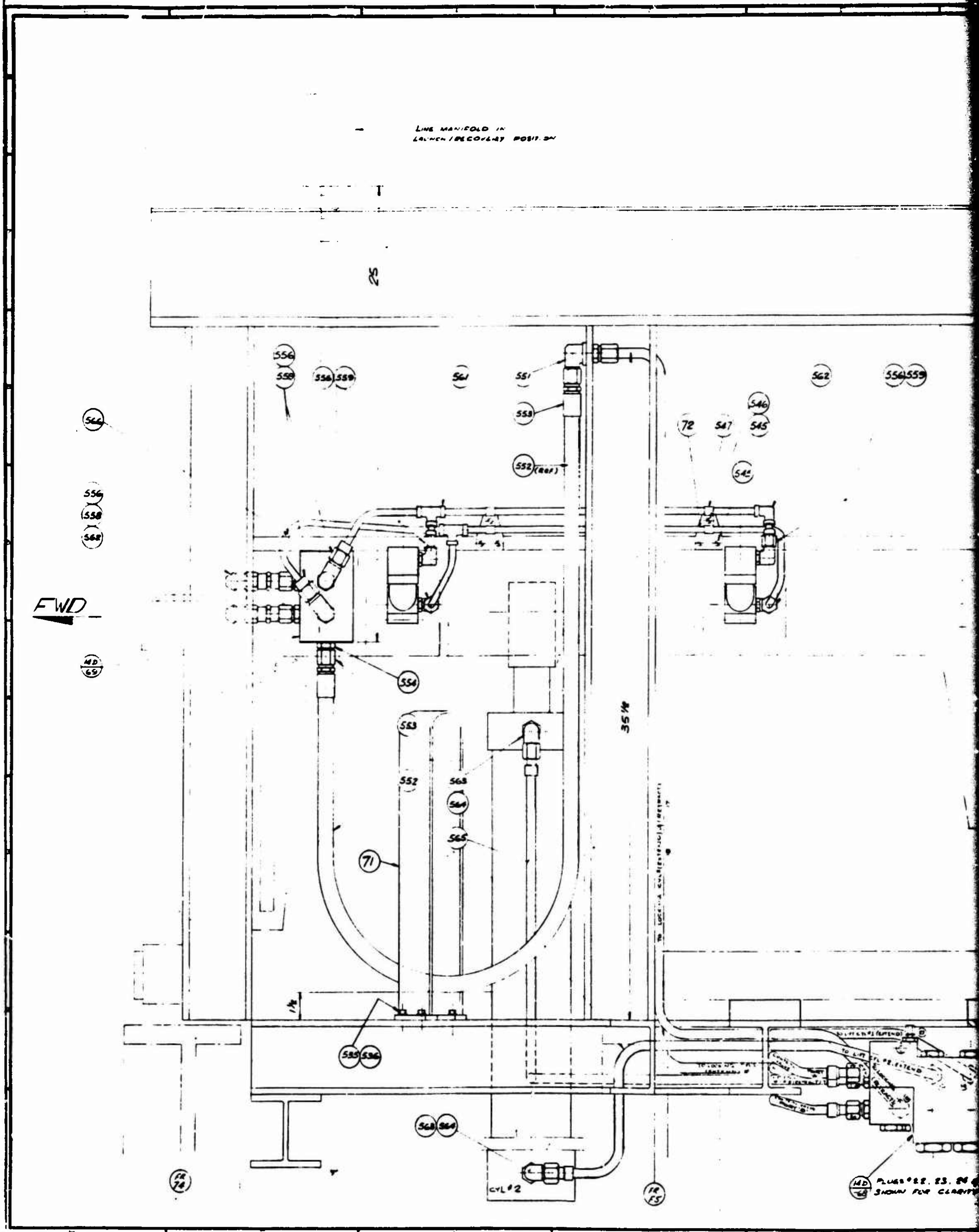
STD TOLERANCES UNLESS NOTED

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

TITLE: Submarine Communications System
Geometry Drawing

SCALE: 1/2

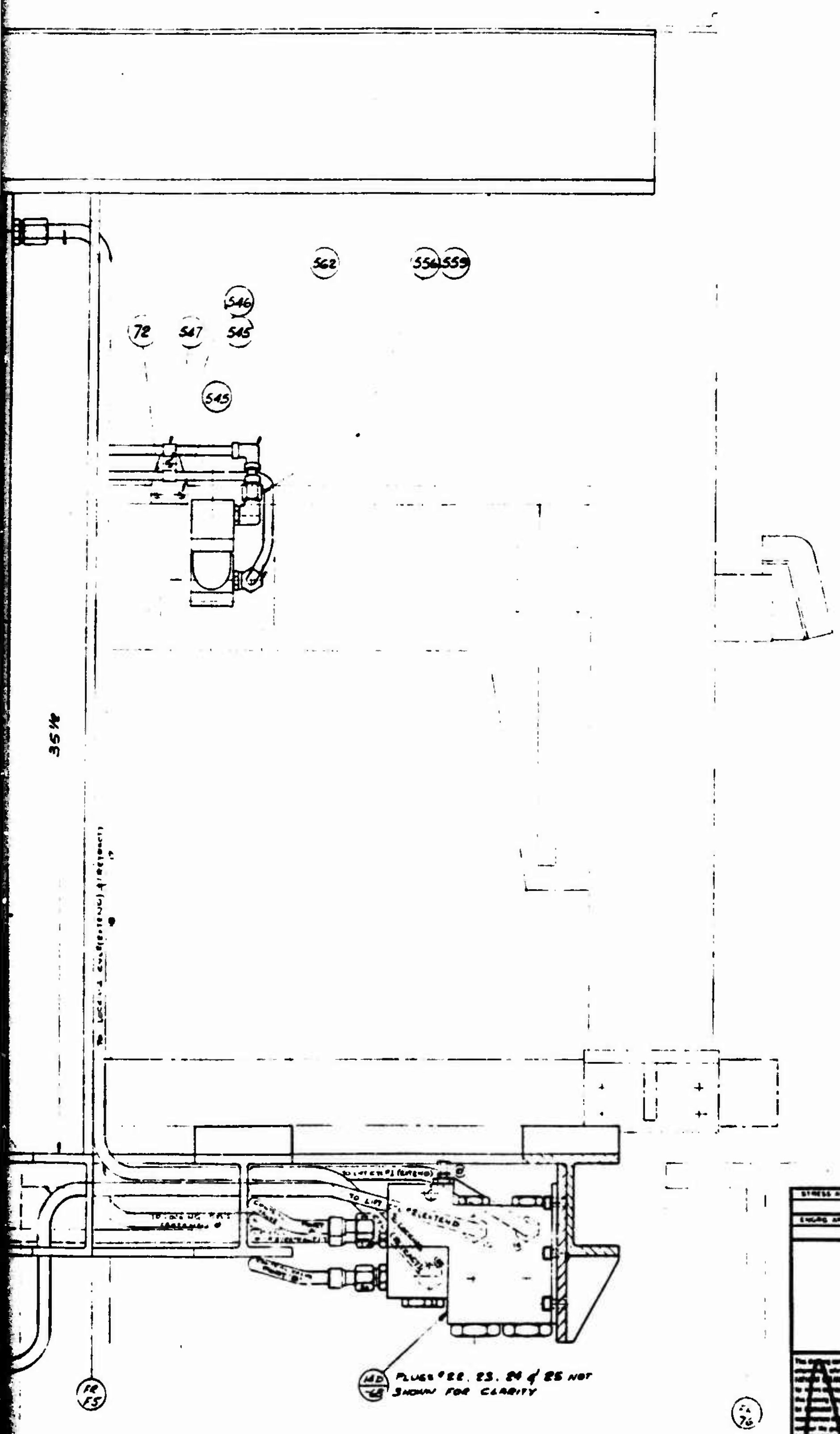
DWG NO: 4D — SHEET 5 of 7 — Rev. A



LINE MANIFOLD IN
LAUNCH/RECOVERY POSITION
25
556
558
556 559
561
551
553
552 (REF)
562
556 559
546
72
547
545
566
556
558
568
FWD
554
553
552
568
564
565
71
35¼
555 556
568 564
CYL #2
FR 74
FR 75
PLUGS #22, 23, 24
SHOWN FOR CLARITY

SEE SEPARATE PARTS LIST NO.	DWG NO.	SHEET	
14D	14D	6 of 7	A

NO	NOTES
1	SEE SHT 1



A	ALL	ISSUED FOR MANUFACTURE	
SYM	ZONE	REVISION	BY / CHK'D / APR / DATE

STRESS APPROVED | DATE

ENGRG APPROVED | DATE

QUANTITIES REQUIRED FOR NEXT ASSEMBLY

WEIGHTS

STD. TOLERANCES UNLESS NOTED
3 PLACE DECIMALS
2 PLACE DECIMALS
FRACTIONS
ANGULARITY
MACHINE FINISH

FATHOM OCEANOLOGY LIMITED
PORT CREDIT – ONTARIO – CANADA

TITLE: SUBMARINE COMMUNICATION SYSTEM B143 BUOY – HYDRAULIC ASSEMBLY

SCALE: HALF

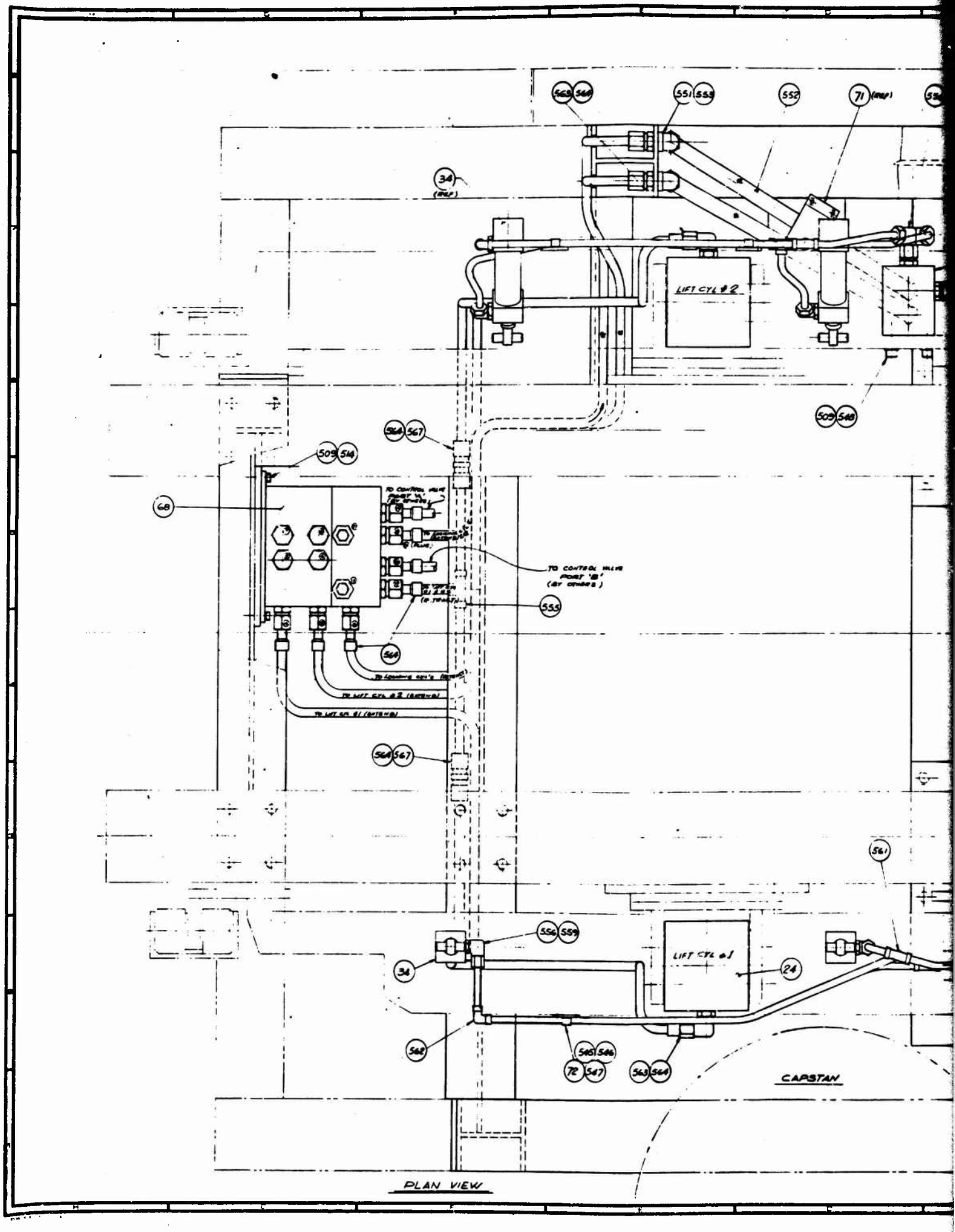
ALL DIMENSIONS IN INCHES UNLESS NOTED

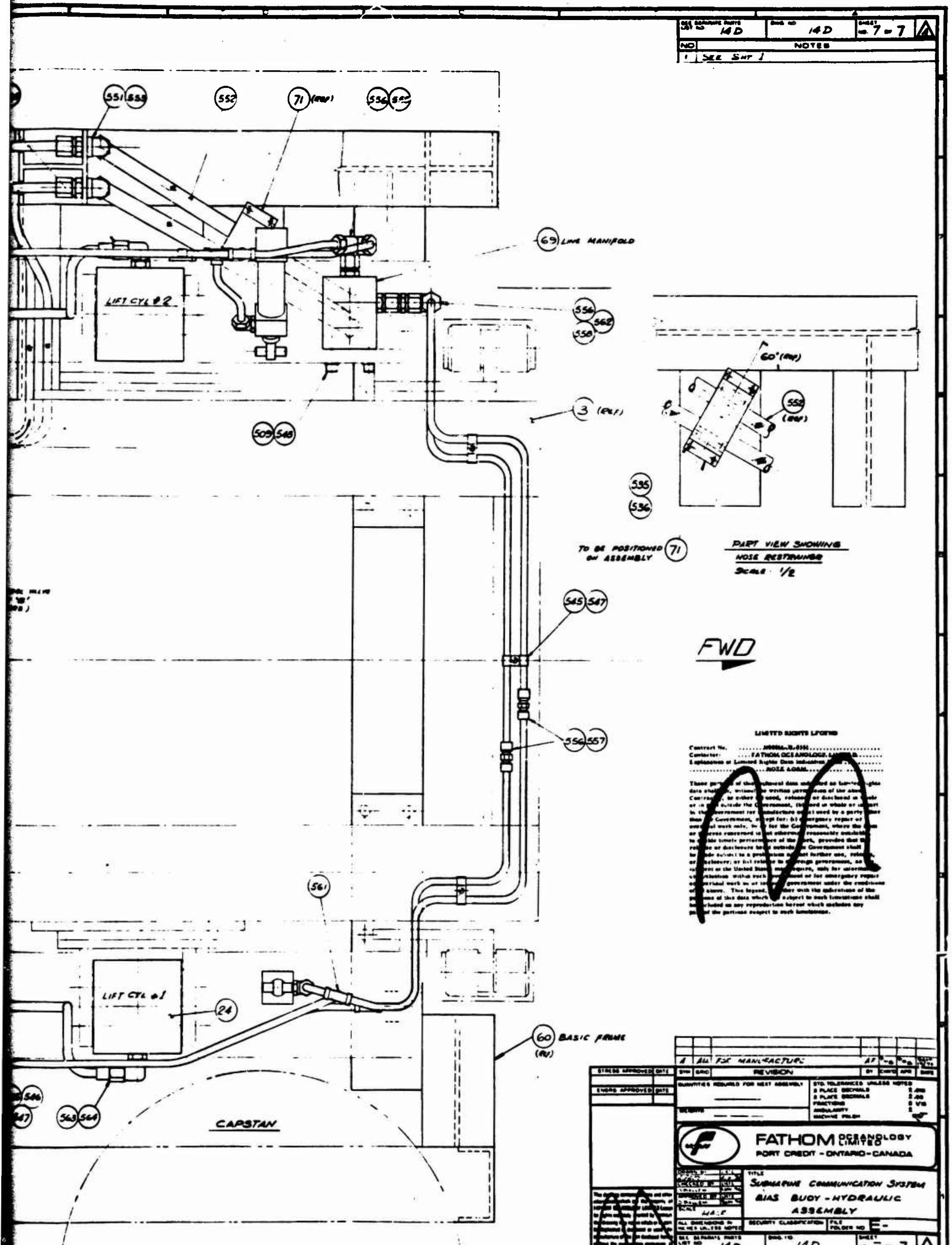
SECURITY CLASSIFICATION | FILE FOLDER NO.

SEE SEPARATE PARTS LIST NO.	DWG NO.	SHEET	
14D	14D	6 of 7	A

B

175


LIFT CYL # 2
LIFT CYL # 1
CAPSTAN
TO CONTROL VALVE PORT 'B' (BY OTHERS)
PLAN VIEW



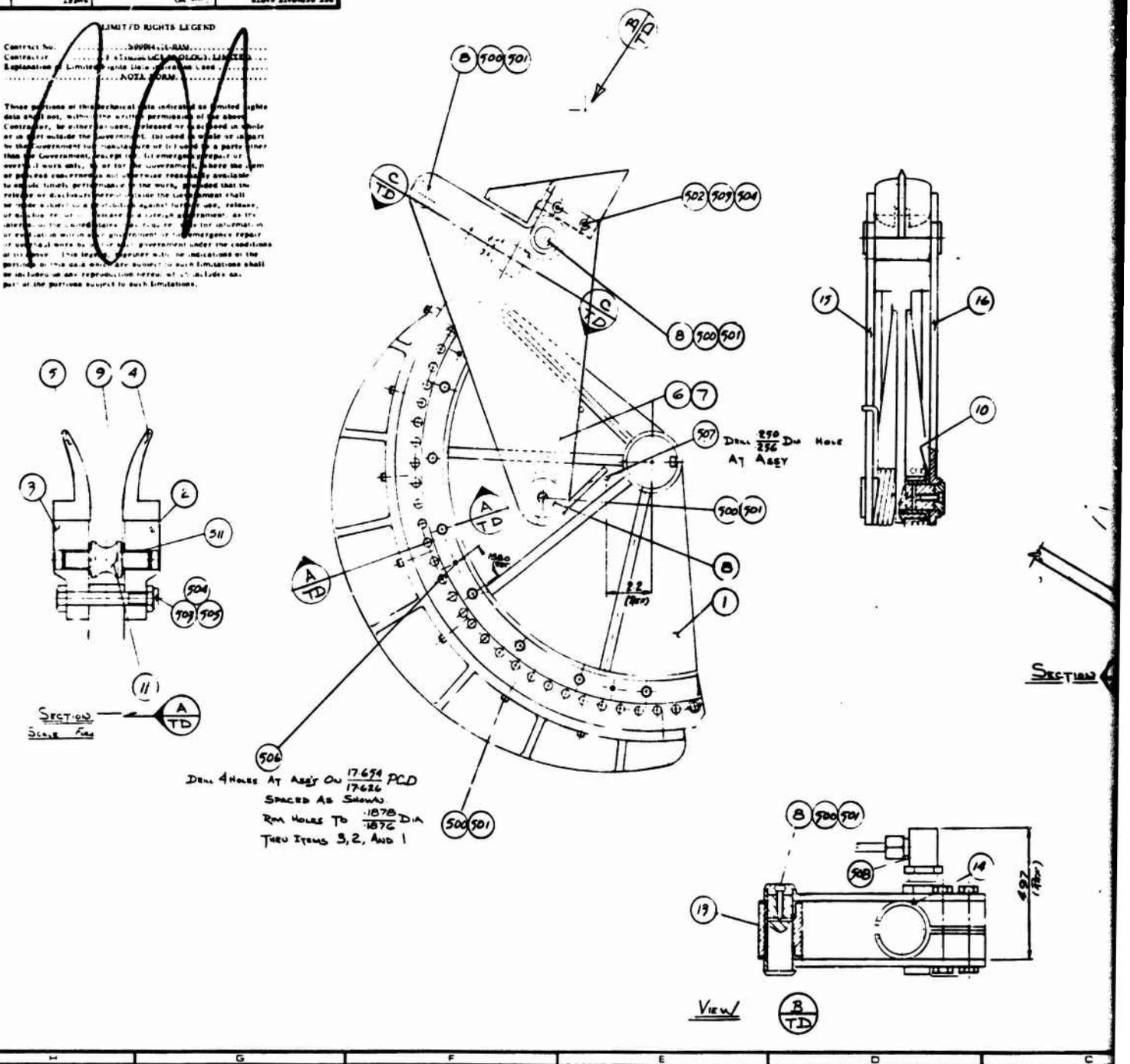
14D
14D
7 - 7
NO
NOTES
1 SEE SHT 1
551 555
552
71 (REF)
556 557
69 LINE MANIFOLD
LIFT CYL #2
556
562
558
60° (REF)
552 (REF)
3 (REF)
509 548
535
536
TO BE POSITIONED ON ASSEMBLY
71
PART VIEW SHOWING HOSE RESTRAINER
SCALE 1/2
545 547
FWD
556 557
561
LIFT CYL #1
24
60 BASIC FRAME (REF)
546
547
563 564
CAPSTAN
REVISION
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
SUBMARINE COMMUNICATION SYSTEM
BIAS BUOY - HYDRAULIC ASSEMBLY
14D
14D
7 - 7

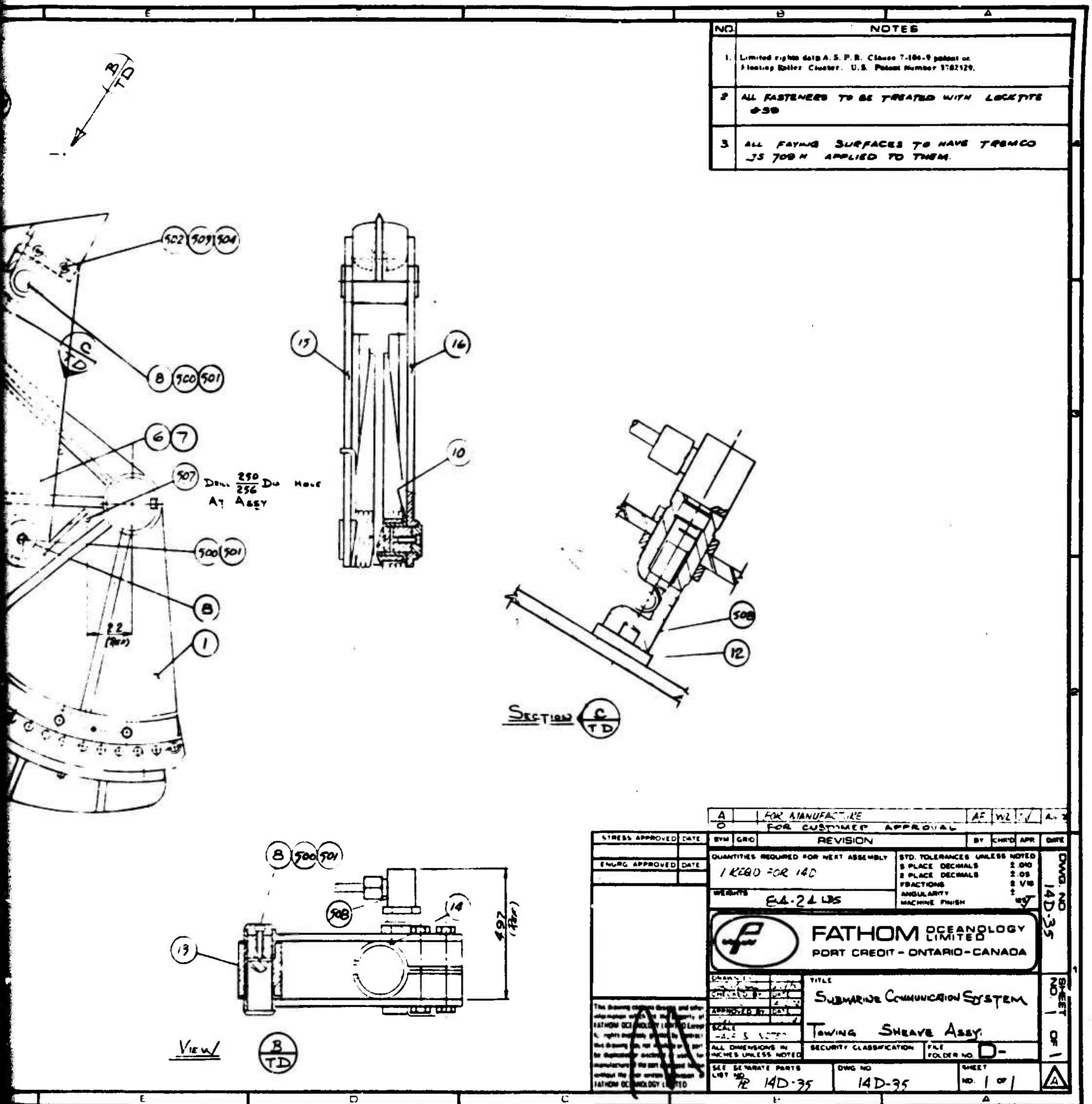
8

LIMITED RIGHTS LEGEND

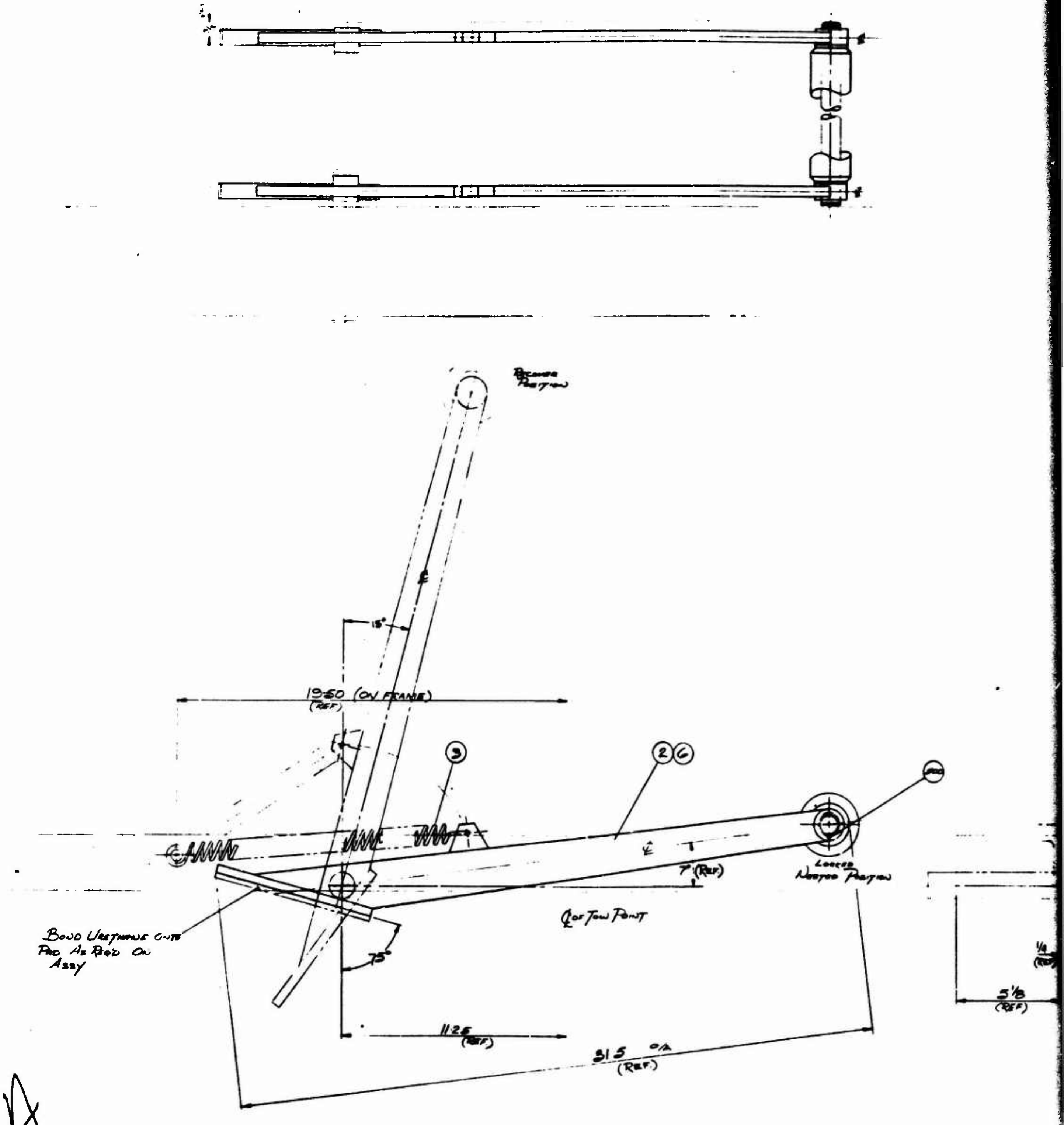
Contract No. .....
Contractor .....
Explanation of Limited Rights Data Deleted .....
.....NOTA FORM.....

These portions of this mechanical data indicated as limited rights data shall not, without the written permission of the above Contractor, be used, released or disclosed outside the Government, utilized in whole or in part by the Government for manufacture or in behalf of a party other than the Government, except for emergency repair or overhaul work only, by or for the Government, where the item or process concerned is not otherwise reasonably available to enable timely performance of the work, provided that the release or disclosure hereof outside the Government shall be made subject to a prohibition against further use, release, or disclosure of the data by a foreign government, as the interests of the United States may require for information or evaluation within such government or for emergency repair or overhaul work by or for such government under the conditions of this paragraph. This legend, however, and the indications of the portions of this data which are subject to such limitations shall be included on any reproduction hereof which includes any part of the portions subject to such limitations.

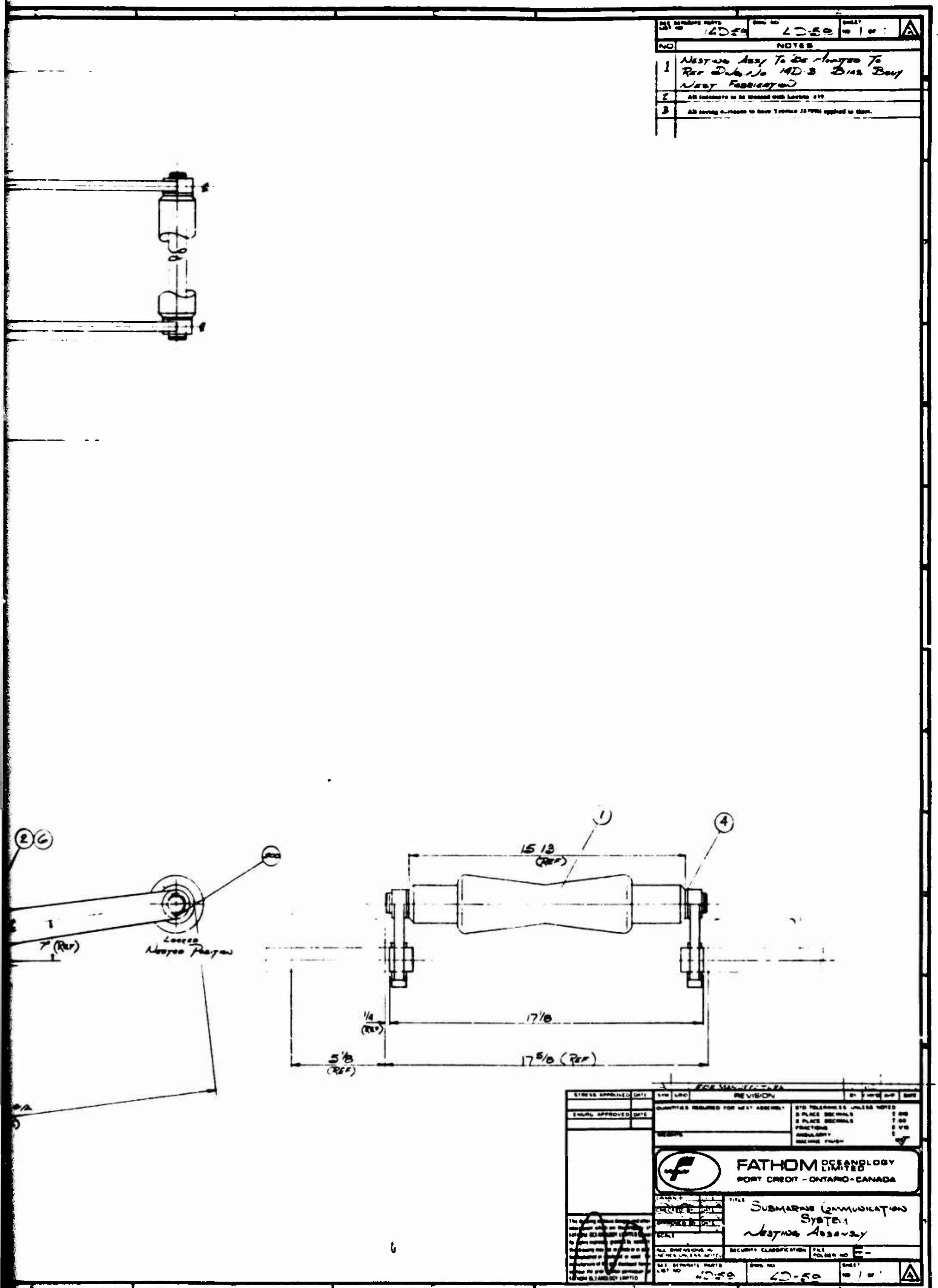



NOTES
1. Limited rights data A.S.P.R. Clause 7-104-9 patent on Floating Roller Cluster. U.S. Patent Number 3782129.
2 ALL FASTENERS TO BE TREATED WITH LOCKTITE #59
3 ALL FAYING SURFACES TO HAVE TREMCO JS 709 H APPLIED TO THEM.
B/TD
502 503 504
C/TD
8 500 501
6 7
507 DRILL .250/.256 DIA HOLE AT ASSY
500 501
8
2.2 (REF)
1
15
16
10
508
12
SECTION C/TD
8 500 501
508
14
13
4.27 (REF)
VIEW B/TD
A FOR MANUFACTURE AF WZ
O FOR CUSTOMER APPROVAL
SYM GRID REVISION BY CHK'D APR DATE
STRESS APPROVED DATE
ENGRG APPROVED DATE
QUANTITIES REQUIRED FOR NEXT ASSEMBLY
1 REQD FOR 14D
WEIGHTS EA. 24 LBS
STD. TOLERANCES UNLESS NOTED
3 PLACE DECIMALS ±.010
2 PLACE DECIMALS ±.05
FRACTIONS ± 1/16
ANGULARITY ±
MACHINE FINISH
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
DRAWN BY
CHECKED BY DATE
APPROVED BY DATE
SCALE
TITLE
SUBMARINE COMMUNICATION SYSTEM
TOWING SHEAVE ASSY.
ALL DIMENSIONS IN INCHES UNLESS NOTED
SECURITY CLASSIFICATION
FILE FOLDER NO. D-
SEE SEPARATE PARTS LIST NO. 14D-35
DWG NO 14D-35
SHEET NO. 1 OF 1
DWG. NO 14D-35
SHEET NO. 1 OF 1

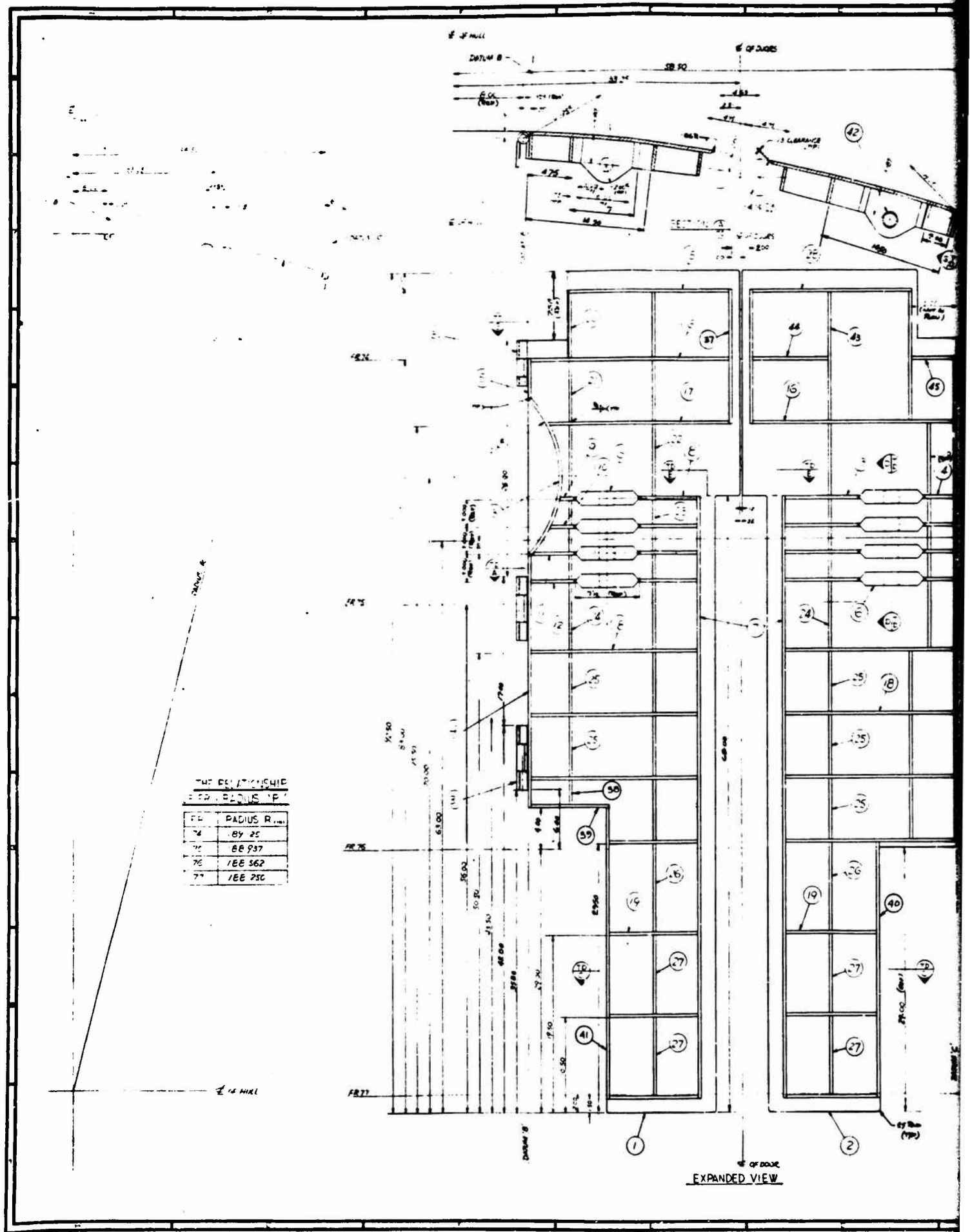
B



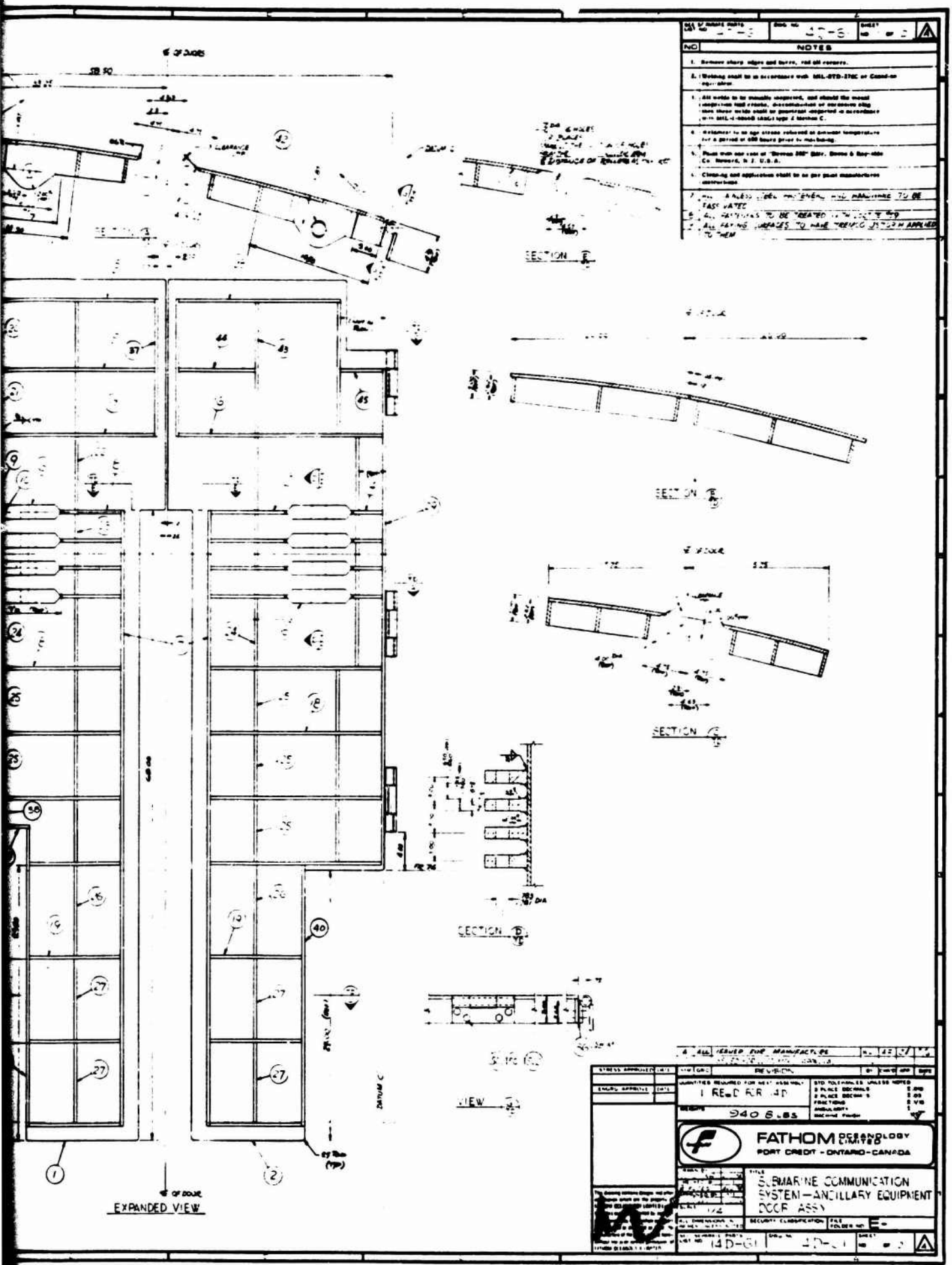
19.50 (ON FRAME)
(REF)
15°
3
2 6
7° (REF)
LOCKED
NESTED POSITION
℄ OF TOW POINT
BOND URETHANE ONTO
PAD AS REQD ON
ASSY
75°
11.25
(REF)
31.5 O/A
(REF)
5 1/8
(REF)


NOTES
1 Nesting Assy To Be Mounted To Ref Dwg No 14D-3 Bias Buoy Nest Fabrication
15 13 (REF)
1
4
17 1/8
1/4 (REF)
5 1/8 (REF)
17 5/8 (REF)
7" (REF)
Locked Nested Position
REVISION
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
Submarine Communication System
Nesting Assembly
4D-59
4D-59

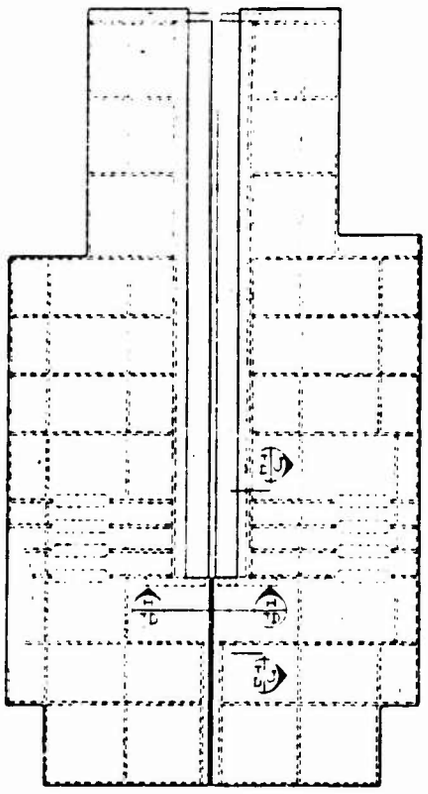
B

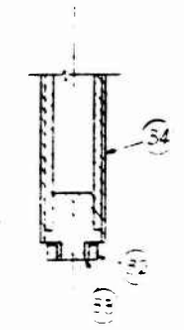


FR	RADIUS R (mm)
74	184 25
75	88 937
76	188 562
77	188 250

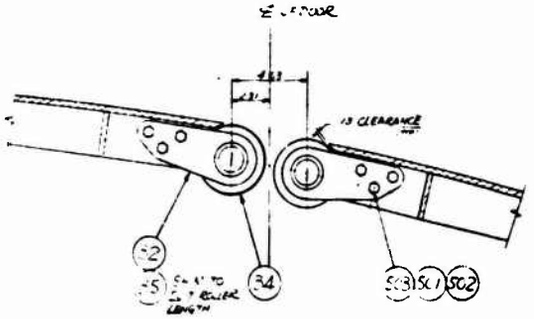

NOTES
SECTION
SECTION
SECTION
SECTION
VIEW
EXPANDED VIEW
FATHOM
PORT CREDIT - ONTARIO - CANADA
SUBMARINE COMMUNICATION
SYSTEM - ANCILLARY EQUIPMENT
DOOR ASSY

B



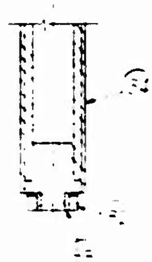


SECTION (J/TD)
SCALE 1/4

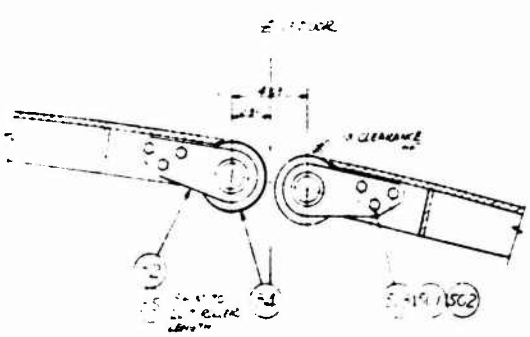


SECTION (H/TD)
SCALE 1/4

NO	NOTES



SECTION (I / TD)
SCALE 1/4



SECTION (H / TD)
SCALE 1/4

SYM	GRID	REVISION	BY	CHK'D	APP	DATE
4		FOR MANUFACTURE				

STRESS APPROVED | DATE
ENGRG APPROVED | DATE

QUANTITIES REQUIRED FOR NEXT ASSEMBLY: SEE SHT 1
WEIGHTS: SEE SHT

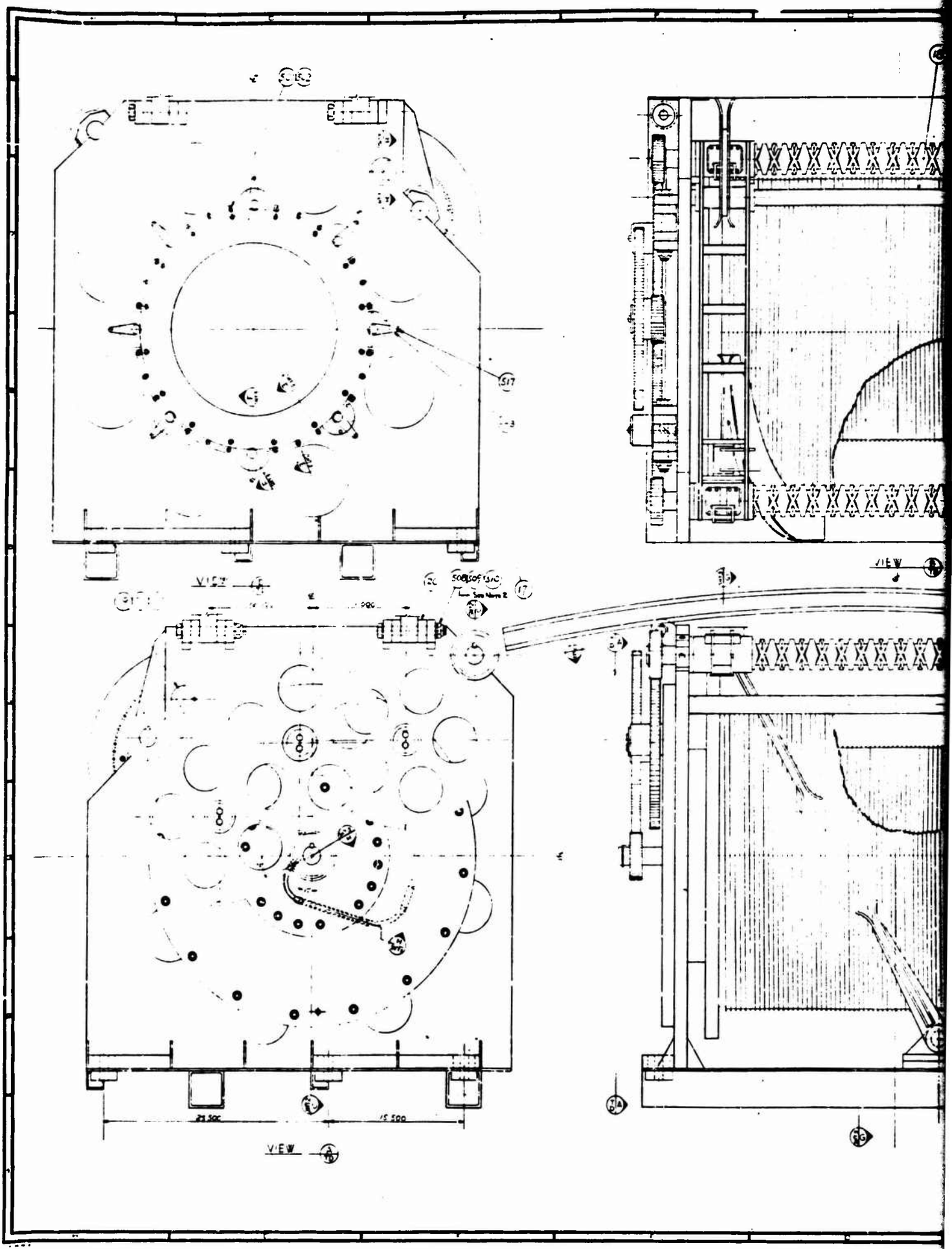
STD TOLERANCES UNLESS NOTED
3 PLACE DECIMALS ± .010
2 PLACE DECIMALS ± .03
FRACTIONS ± 1/16
ANGULARITY ±
MACHINE FINISH 125

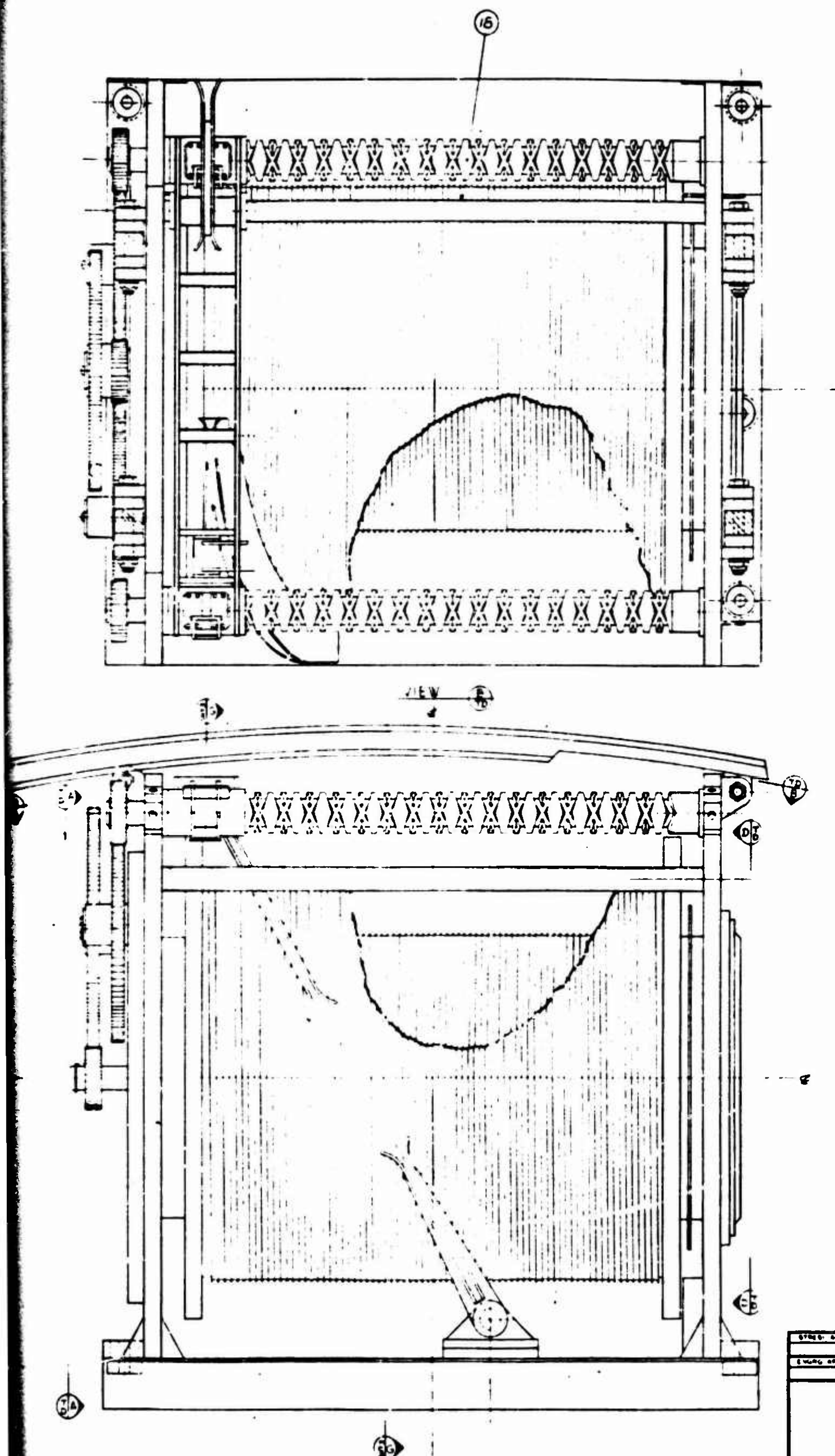
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

TITLE: SUBMARINE COMMUNICATION SYSTEM-ANCILLARY EQUIPMENT DOOR ASSY

DRAWN BY
CHECKED BY
APPROVED BY
SCALE
ALL DIMENSIONS IN INCHES UNLESS NOTED
SECURITY CLASSIFICATION
FILE FOLDER NO D-
SEE SEPARATE PARTS LIST NO
DWG NO
SHEET NO 2 OF 2

This drawing contains design and information ... FATHOM OCEANOLOGY LIMITED ... without the prior written permission of FATHOM OCEANOLOGY LIMITED


VIEW
VIEW
VIEW



SEE SEPARATE PARTS LIST NO.	DWG. NO.	SHEET	
6H	6H	1 of 3	A

NO.	NOTES
1	REAM HOLE THRU ITEMS 6H-3 AND 6H-11 ON FINAL ASS'Y TO SUIT BOLT ITEM 50B
2	ALL STAINLESS STEEL FASTENERS AND HARDWARE TO BE PASSIVATED
3	ALL FASTENERS TO BE TREATED WITH LOCTITE [illegible]
4	ALL FAYING SURFACES TO HAVE "REMCO [illegible]" APPLIED TO THEM

LIMITED RIGHTS LEGEND

Contract No. [illegible]
Contractor: FATHOM OCEANOLOGY LIMITED
[illegible]
NOTE FORM

[illegible]

Limited Rights Data [illegible]

1. Patent on Double Drum
   Canada [illegible]
   U.S.A. [illegible]

2. Patent on Lip & Latch
   U.S.A. [illegible]

SYM	DWG	REVISION	BY	CHK'D	APP	DATE
A	ALL	FOR MANUFACTURE	WL	[illegible]		[illegible]

STRESS APPROVED	DATE
ENG'G APPROVED	DATE
QUANTITIES REQUIRED FOR NEXT ASSEMBLY	1 REQ'D FOR 3 207
WEIGHT	5577 LBS
STD TOLERANCES UNLESS NOTED	2 PLACE DECIMALS ±.010; 3 PLACE DECIMALS ±.005; FRACTIONS ±1/16; ANGULARITY ±; MACHINE FINISH

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

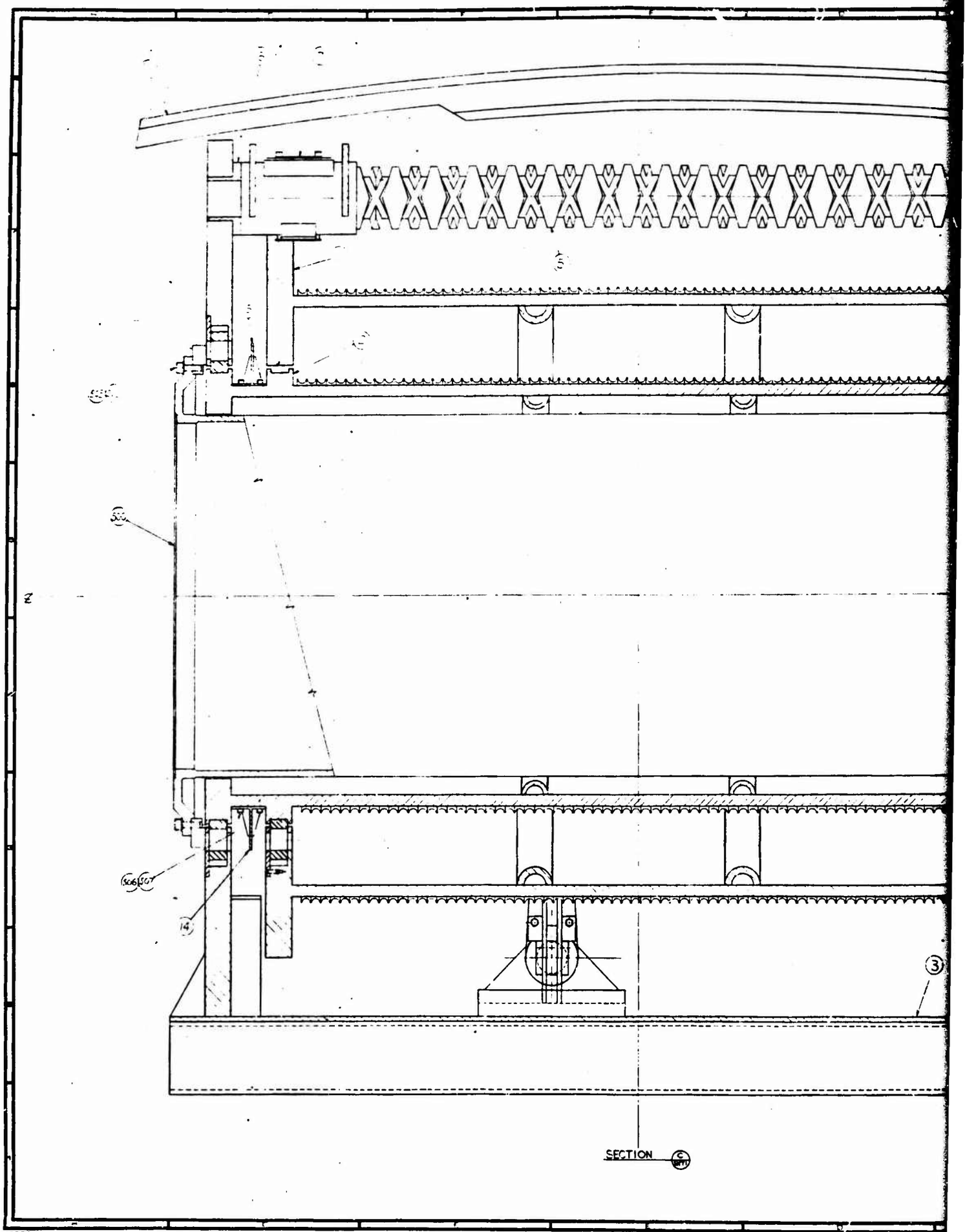
TITLE: SUBMARINE COMMUNICATION SYSTEM - WINCH ASSEMBLY

SCALE: 1:4

ALL DIMENSIONS IN INCHES UNLESS NOTED | SECURITY CLASSIFICATION | FILE FOLDER NO.

SEE SEPARATE PARTS LIST NO.	DWG. NO.	SHEET	
6H	[illegible]	1 of 3	A

B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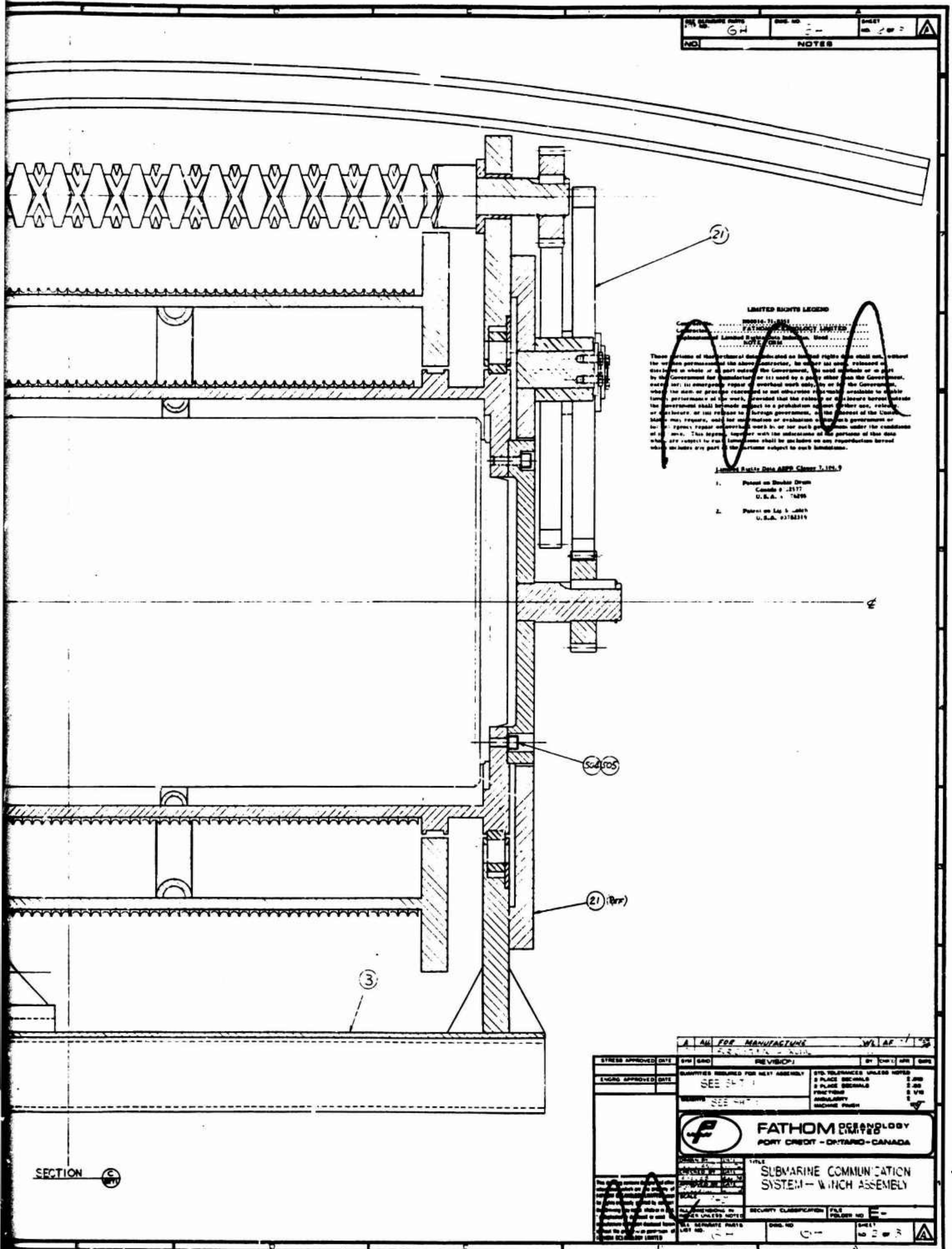
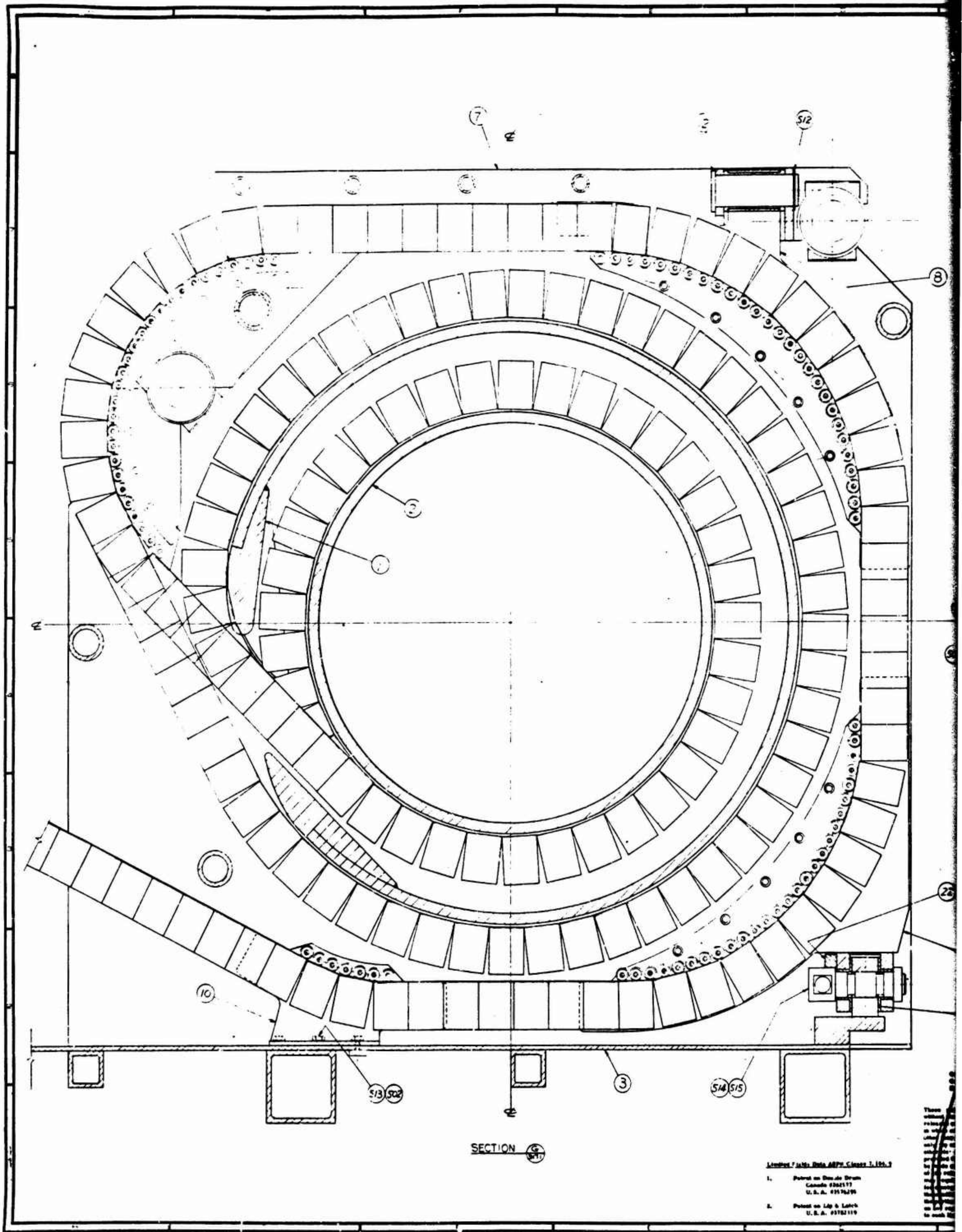


GH
NOTES
21
LIMITED RIGHTS LEGEND
FATHOM OCEANOLOGY LIMITED
NOTE FORM
Limited Rights Data ASPR Clause 7.104.9
1. Patent on Double Drum
2. Patent on Lay & Latch
56 505
21 (REF)
3
SECTION C
A ALL FOR MANUFACTURE WL AF
STRESS APPROVED DATE
ENGRG APPROVED DATE
REVISION
QUANTITIES REQUIRED FOR NEXT ASSEMBLY
SEE SHT 1
SEE SHT 1
STD. TOLERANCES UNLESS NOTED
FRACTIONS
ANGULARITY
MACHINE FINISH
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
SUBMARINE COMMUNICATION
SYSTEM — WINCH ASSEMBLY
SCALE
SECURITY CLASSIFICATION
FILE FOLDER NO
DWG. NO
SHEET NO 2 of 3
FATHOM OCEANOLOGY LIMITED

B



7
512
8
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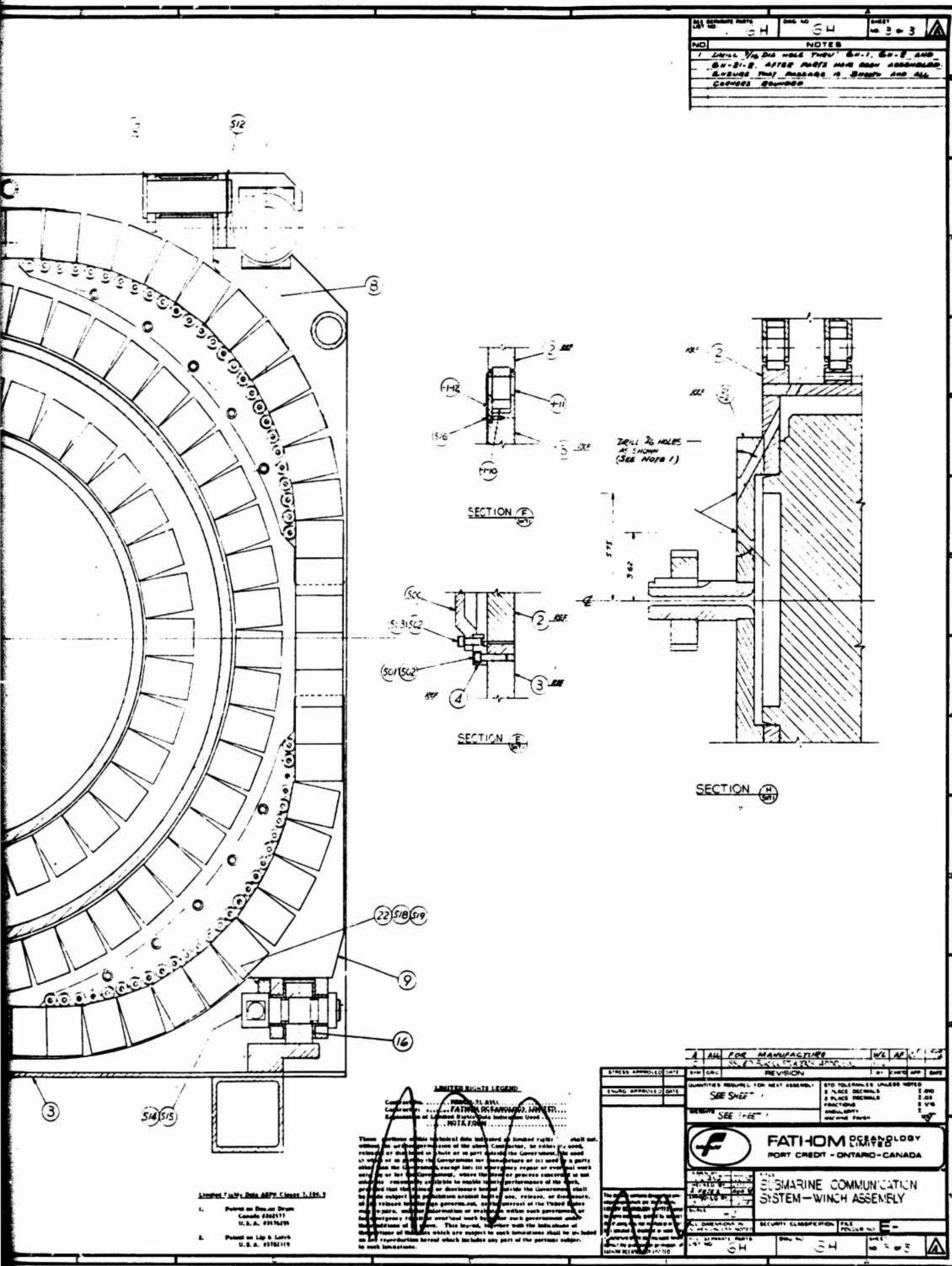
513
502
514
515
SECTION G
Patent on Lip & Latch
U.S.A.


DWG NO 6H
SHEET NO. 3 of 3
NOTES
1 DRILL 1/16 DIA HOLE THRU' 6H-1, 6H-8 AND 6H-21-8. AFTER PARTS HAVE BEEN ASSEMBLED. ENSURE THAT PASSAGE IS SMOOTH AND ALL CORNERS ROUNDED
S12
8
2 REF
FH2
FH11
S16
3 REF
FH10
SECTION F
DRILL 1/16 HOLES AS SHOWN (SEE NOTE 1)
5.75
3.62
SECTION H
S00
2 REF
S13 S62
S01 S62
3 REF
4
REF
SECTION E
22 S18 S19
9
16
3
S14 S15
A ALL FOR MANUFACTURE
REVISION
QUANTITIES REQUIRED FOR NEXT ASSEMBLY SEE SHEET 1
WEIGHTS SEE SHEET 1
STD TOLERANCES UNLESS NOTED
3 PLACE DECIMALS ± .010
2 PLACE DECIMALS ± .03
FRACTIONS ± 1/16
FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA
SUBMARINE COMMUNICATION SYSTEM—WINCH ASSEMBLY
SECURITY CLASSIFICATION
DWG NO 6H
LIMITED RIGHTS LEGEND
Patent on Lip & Latch U.S.A. 03702119

c5-

FATHOM OCEANOLOGY LIMITED
PORT CREDIT, ONTARIO, CANADA

PARTS LIST

SHEET NO. 1 OF 14

DWG. NO. PL 14D

RECORD OF REVISIONS

SYM	SHEET	PART NO.	REVISIONS	APP.	DATE	SYM	SHEET	PART NO.	REVISIONS	APP.	DATE
O	ALL	ALL	[illegible]								
A	ALL	ALL	[illegible]	[illegible]	[illegible]						

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A

SHEET NO 2 OF 14

DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHT
14D-1- - -	1		*	SLIDE FRAME (INBOARD)	[illegible]
-2- - -	1		*	SLIDE FRAME (OUTBOARD)	[illegible]
-3- - -	1		*	NEST FRAME	[illegible]
-4 - -	1	COMMON DWG	*	SCISSOR ARM (OUTBOARD)	[illegible]
-5- - -	1			" (INBOARD)	[illegible]
-6- - -	2		*	"	[illegible]
-7- - -	1	COMMON DWG	*	LOCKING ARM	[illegible]
-8- - -	1			"	[illegible]
-9- - -	1	COMMON DWG	*	LOCKING ARM	7.25
-10- - -	1			"	7.25
-11- - -	2	COMMON DWG	*	NEST LINK	[illegible]
-12- - -	2			"	[illegible]
-13- - -	2		*	LINK - TOWING SHEAVE	[illegible]
-14- - -	2	COMMON DWG		FRAME - LONG	[illegible]
-15- - -	1		*	FRAME - SHORT	[illegible]
-16- - -	1			BASE - INBOARD	121.60
-17- - -	1			BASE - OUTBOARD	121.60
-18- - -	4		*	PIN - SCISSOR ARM	5.00
-19- - -	8		*	BUSHING - SCISSOR ARM	.40
-20- - -	8		*	BEARING HOUSING - SCISSOR ARM	28.00
- - - -					
-21- - -	2		*	NEST LATCH ASS'Y	28.12
-22- - -	2		*	PIN - LIFT CYLINDER	12.00
-23- - -	2		*	ROD EYE - LIFT CYLINDER	19.23
-24- - -	2		*	LIFT CYLINDER	300.00
-25- - -	1	COMMON DWG	*	BRK'T - NEST CYL (INBOARD)	31.35
-26- - -	1			" - " (OUTBOARD)	31.35

COMPILED BY A. FLUES — DATE JULY 2

CHECKED BY W. LIANG — DATE AUG 21

APPROVED [illegible] — DATE [illegible]

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A | SHEET NO 3 OF 14 | DWG NO PL 14D

PART NO.	QUANT.	MATERIAL	UN'T	DESCRIPTION		
14D-27-- - -	8	} COMMON DWG	*	ROLLERS - SCISSOR ARM	21	.00
-28- - -	16	J		— " —	24	.00
-29- - -	12		*	SHAFT - ROLLER	12	.24
-30- - -	1		*	PAD - NEST FRAME	6	.50
-31- - -	1	} COMMON DWG	*	BRACKET - NESTING	14	.91
-32- - -	1	}		— " —	14	.91
-33- - -	1		*	BUOY LOCKING ASS'Y	28	.07
-34- - -	4		*	CYLINDER - BUOY LOCKING	40	.00
-35- - -	1		*	TOWING SHEAVE ASS'Y	84	.24
-36- - -	1	} COMMON DWG	*	GUIDE PLATE - BUOY	55	.20
-37- - -	1	}		— " —	55	.20
-38- - -	1		*	SWITCH ACTUATOR ASS'Y	5	.10
-39- - -	2		*	FIN - SCISSOR ARM.	3	.40
-40- - -	16		*	CAP - SCISSOR PIN	8	.16
-41- - -	2		*	PIN - LINKAGE ANCHOR	4	.28
-42- - -	2	SLB-175-1		BUSHING	3	.00
-43- - -	2		*	PIN - LINKAGE ARM	3	.64
-44- - -	2			— " —	3	.40
-45- - -	1		*	SHAFT - TOWING SHEAVE	6	.56
-46- - -	6		*	RETAINER	2	.10
-47- - -	1		*	CROSS SHAFT - LINKAGE ARM	11	.50
-48- - -	2		*	PIN - ECCENTRIC	18	.00
-49- - -	3		*	LINKAGE - DOOR (OUTBOARD)	33	.75
-50- - -	4		*	PIN - DOOR LINKAGE	21	.30
-51- - -	12	FLB-150-2		FLANGE BUSHING	2	.00
-52- - -	3	(SEE DWG 14D-49	*	LINKAGE - DOOR (INBOARD)	37	.11
- - - -						

DRAWN BY A. FESES | DATE JULY '74 | CHECKED BY W. TIANG | DATE AUG. 74 | APPROVED BY [illegible] | DATE

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A | SHEET NO 4 OF 14 | DWG NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHT EACH
14D-53- - -	1		*	BRACKET - DOOR LINKAGE (INBOARD)	3A.25
- - - -					
-54- - -	1		*	BRACKET - DOOR LINKAGE (OUTBOARD)	40.17
- - - -					
-55- - -	1		*	SWITCH ACTUATOR	.33
-56- - -	2		*	BRACKET - DOOR SWITCH	6.12
-57- - -	1	COMMON DRAWING	*	CUSHION - BUOY	38.47
-58- - -	1		*	CUSHION - BUOY	58.93
-59- - -	1		*	NESTING ASS'Y	29.00
-60- - -	1		*	BASIC FRAME ASS'Y	627 00
-61- - -	1		*	DOOR ASS'Y	241 00
-62- - -	6	FLB-075-3		BUSHING	1.25
-63- - -	1	SEE 14D-14/15/16/17	*	LONG SUPPORT	68 00
-64- - -	2		*	PIN - NESTING ARM	3.4
-65- - -	2		*	PIN - NESTING SPRING	1.40
-66- - -	1		*	BUOY LOCKING ASSY	37 80
-67- - -	1		*	BRACKET - BUOY SWITCH	1.17
-68- - -	1		*	HYD. MANIFOLD ASS'Y	50.0
-69- - -	1		*	HYD. LINE MANIFOLD	15 0
-70- - -		FLB-		BUSHING	
-71- - -	1		*	HYD. HOSE RESTRAINER	5.72
-72- - -	4		*	HYD. BRACKET	.27
-73- - -	8	SLB-150-1		BUSHING	NE
- - - -					
- - - -					
- - - -					
- - - -		* SEE DRAWING		FOR MORE INFORMATION	

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED	DATE
A. FEJES	JULY '74	W. LIANG	AUG. 74	J. Marshall	Aug '74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT · ONTARIO · CANADA

PARTS LIST

A	SHEET NO 5 OF 14	DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. FEJES	JULY '74	V. LIANG	AUG, 74	[illegible]	[illegible]

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

Rev. A | SHEET NO 6 OF 14 | DWG. NO PL 14

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	[illegible]
14D -500	49		SCREW	SOCKET HEAD, CAP	4.70
				1/2 - 13NC - 3A x 1 1/4 LONG	
				(MS-16995-95)	
14D -501	12		SCREW	SOCKET HD, CAP	1.26
				1/2 - 13NC - 3A x 1 1/2 LONG	
				(MS - 16995 - 96)	
14D -502	16		SCREW	HEX. HD. MACHINE	4.99
				3/4 - 10NC - 2A x 1 3/4 LG	
				(MS - 35307 - 436)	
14D -503	40		LOCK WASHER	3/4 NOM (MS-35333-146)	2.10
14D -504	28	A.I.S.I TYPE	FLAT WASHER	1" NOM. (AN-960-C1616)	4.36
		300 SERIES, CRES			
14D -505	24	QQ-S-763d.	RETAINING RING	WALDES TRUARC #5100-100	
14D -506	16		SET SCREW	CUP POINT	.23
				3/8 - 16NC - 3A (MS-51017-101)	
				x 3/8 LG	
14D -507	2		SET SCREW	CUP -POINT	
				3/8 - 16NC - 3A (MS-51017-106)	.05
				x 7/8 LG	
14D -508	24		SCREW	SOCKET HEAD, CAP	1.13
				3/8 - 16NC - 2A x 1 1/4 LONG	
				(MS 16995 - 82)	
14D -509	34		LOCK WASHER	3/8 NOM.	.28
				(MS-35338-141	

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. FEJES	JULY '74	W. LIANG	AUG, 74	[illegible signature]	[illegible] 74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

Rev. A | SHEET NO 7 OF 14 | DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	
14D-510	16	A.I.S.I TYPE 300 SERIES, CRES QQ-S-763d	SCREW	SOCKET HEAD - CAP 1/2-13NC-2A x 2 1/2 LONG (MS 16995-100)	2.58
14D-511	16		SCREW	FLAT C'SUNK HD. SLOTTED 1/2-13NC-2A x 2 1/2 LONG (MS 35239-147)	2.13
14D-512	16		SCREW	SOCKET HEAD - CAP 5/16-18NC-2A x 1 LONG (MS 16995-66)	.45
14D-513	84		LOCK WASHER	1/2 NOM (MS 35338-143)	1.78
14D-514	10		SCREW	SOCKET HD. CAP 3/8-16NC-2A x 1" LONG (MS 16995-81)	.16
14D-515	28		SCREW	SOCKET HEAD, CAP 3/8-16 UNC-2A x 1 1/4" LG (MS 16995-82)	.13
14D-516	28		LOCK WASHER	3/8 NOM (MS 35338-141)	.32

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. FEJES	JULY '72	W. LIANG	AUG. [illegible]	[illegible]	[illegible]

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A | SHEET NO 8 OF 14 | DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	
14D - 3 - - -	6		LOCK NUT	HEX, SELF LOCKING TYPE NON-METALLIC INSERT 3/8-16 UNC-2B ESNA Nº 7ONE-066	·11
14D -519- - -	6		FLAT WASHER	3/8 NOM (AN-960-C516L)	·15
14D -520- - -	16		FLAT WASHERS	5/16 NOM (AN-960-C516L)	·12
14D -521- - -	32	A.I.S.I. TYPE 300 SERIES QQ-S-763d.	SCREW	SOCKET HEAD, CAP 1/4-20NC-2A x 1" LONG (MS-16995-52)	·55
14D -522- - -	2		PIN	·25 NOM. SPRING PIN 2 1/2 LG (MS-9048-242)	NE
14D -523- - -	A/R		FLAT WASHER	1 3/4 I.D. x 2 1/2 O.D. x ·032 THK	·78
14D -524- - -	10		FLAT WASHER	1 3/4 I.D x 2 1/2 O.D. x ·060 THK.	·52
14D -525- - -	18		SET SCREW	CONE-POINT 1/4-20 NC-3A x 3/8 LONG (MS-51017-65)	NE

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. FEJES	JULY'74	W. LIANG	AUG'74		

FATHOM OCEANOLOGY LIMITED PORT CREDIT · ONTARIO · CANADA

PARTS LIST

Rev. A — SHEET NO 9 OF 14 — DWG NO PL 142

PART NO.	QUANT.	MATERIAL	UM	DESCRIPTION	WEIGHT
142-526	3	A.I.S.I TYPE 300 SERIES, CRES QQ-S-763d	SCREW	SOCKET HEAD, CAP 1/2-13 NC-2A x 1 1/2 LONG (MS 16995-96)	1.22
-527	4		SCREW	SOCKET HEAD, CAP 3/8-16 NC-2A x 2 1/2 LONG FULL THREAD	.34
-528	34		SCREW	FLAT HEAD, C'SUNK 1/4-20 NC - 3/4 LONG (MS 35239-88)	.51
-529	8		RING	RETAINER RING WALDES TRUARC #5160-150 1 1/2 NOM. - HEAVY DUTY	
-530	4		SCREW	FLAT C'SUNK HEAD 1/2-13 NC-2A x 1 LONG (MS 35239-141)	.23
-531	8		SCREW	SOCKET HEAD, CAP 3/4-10 NC-3A x 2 LONG (MS-16995)	2.70
-532	6		SPRING PIN	.125 NOM. DIA. x 1 3/4 LONG (MS 9048-114)	.06

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. FEJES	JULY'74	W. LIANG	AUG. 74	[illegible]	[illegible]

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A | SHEET NO 10 OF 14 | DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	
14D-533- - -	6		SCREW	SOCKET HD. CAP #10-24 NC-3A x 2 1/4 LG (MS-16995-)	.10
14D-534- - -	6		FLAT WASHER	#10 NOM (AN 960-C10L)	.01
14D-535- - -	8		FLAT WASHER	1/4 NOM (MS 27183-11)	
14D-536- - -	16	A.I.S.I TYPE 300 SERIES, CRES QQ-S-763d	SCREW	SOCKET HD. CAP 1/4-20 NC-2A x 3/4 LONG (MS-16995-50)	.11
14D-537- - -	3		SWITCH	PROXIMITY LIMIT SWITCH MODEL 43-100-D GO (GENERAL EQUIPMENT MFG. CO. INC)	4 .20
14D-538- - -	16		SCREW	SOCKET HEAD, CAP 3/4-10 NC-3A x 2 1/4 LG (MS-16995)	5 .93
14D-539- - -	4		LOCK NUT	1/2-13NC-3B HEX. HD ESNA NO. 73NE-083	.17
14D-540- - -	2		FLAT WASHER	1/2 NOM (MS 27183-18)	.05

COMPILED BY: A. FESES | DATE: JULY '74 | CHECKED BY: W. LIANG | DATE: AUG, 74 | APPROVED: [signature] | DATE: Aug 74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT ONTARIO-CANADA

PARTS LIST

SHEET NO 11 OF 14 — DWG. NO PL 14D — A

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHT
14D -541-	2	AISI TYPE 300 SERIES CRES QQ-S-763 d (for -541, -542, -543)	LOCK NUT	1/2-13NC-3B HEX. HD. ESNA Nº 73NE-083	.09
-542-	2		FLAT WASHER	1/2 NOM (MS 27183-18)	.13
-543-	32		FLAT WASHER	1/4 NOM (AN 960-C416)	NEG
-544-	1	ALLOY STEEL GRADE B (QQ-S-624)	KEY	1/2 x 5/16 x 6 1/2 LG. STANDARD RECTANGULAR PARALLEL KEY. (MS-20065)	.2
-545	12	AISI TYPE 300 SERIES, CRES QQ-S-763 d	SCREW	PAN HEAD, SLOTTED #10-24 UNC-3A x 3/8 LONG	NEG
-546-	2	"	NUT	#10-24 NC HEX. HD	NEG
-547-	6	AISI, TYPE 300 SERIES, CRES		3/8-TUBE CLIP	NEG
-548-	4	AISI, TYPE 300 SERIES, CRES	SCREW	3/8-16 NC-2A x 1 1/2 LONG (MS-16995-83	.12
-549-					
-550-	AR.	ANTI-SEIZE COMP.		LOCKTITE # 59	

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. FEJES	JULY '74	W. LIANG	AUG 74	[signature] SC-	AUG 74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

△A SHEET NO 12 OF 4 | DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHT
14D-551	2	STAINLESS STEEL	ELBOW	BULKHEAD UNION ELBOW	1
				LENZ REF. NO. 3950-8-SS	
-552	2	SYNTHETIC RUBBER	HOSE	AEROQUIP Nº 1509-8	6.7
		INNER TUBE, MULTIPLE		x 6 FEET LONG	
		STEEL WIRE BRAID,		(MIL-H-24135)	
		FABRIC BRAID,			
		NEOPRENE COVER			
-553	4	STAINLESS STEEL	SWIVEL	S.A.E. 37° FLARE SWIVEL	2.8
				AEROQUIP Nº 4-4721-8-	
				-8 (MIL-H-24135)	
-554	2	STAINLESS STEEL	MALE CONNECTOR	"O" RING SEAL - S.A.E	1.2
				STRAIGHT THREAD END	
				PARKER/HANNIFIN	
				#8 F50X-SS	
-555	1	STAINLESS STEEL	TEE	BRAZE-LOK	.2
				PARKER/HANNIFIN #8BJB-SS	
-556	14	STAINLESS STEEL	UNION	BRAZE-LOK - PARKER/HANNIFIN	
				Nº 6X6HB-SS	

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
ANNA FEJES	AUG '74	D BALLEM	SEP 74	[illegible signature]	AUG 74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

SHEET NO 13 OF 14 | DWG NO PL 14D

PART NO.	C	QNT.	MATERIAL	UNIT	DESCRIPTION	WEIGHT
14D-557		2	STAINLESS STEEL	UNION	BRAZE-LOK	1.5
					P/H PART Nº 6XHB-SS	
-558		2	STAINLESS STEEL	MALE CONNECTOR	P/H PART Nº 6F05X-SS	2
-559		10	STAINLESS STEEL	MALE ELBOW	"O" RING SEAL-S.A.E	3.5
					STRAIGHT THREAD	
					P/H 6C5OX-SS	
-560			SPARE NUMBER			
-561		4	STAINLESS STEEL	TEE	BRAZE-LOK	.3
					P/H PART Nº 6 BJB-SS	
-562		4	STAINLESS STEEL	ELBOW	BRAZE-LOK	.4
					P/H PART Nº 6 BEB-SS	
-563		4	STAINLESS STEEL	ELBOW	"O" RING SEAL-S.A.E.	1.6
					STRAIGHT THREAD	
					P/H 8C5OX-SS	
-564		13	STAINLESS STEEL	UNION	BRAZE-LOK - P/H PART	.8
					Nº 8 X6HB-SS	

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
A. VA FEJES	AUG '74	D BALLEM	SEP 74	[illegible] 584	AUG 74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

Δ A | SHEET NO/4 OF/4 | DWG. NO PL 14D

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHTS
14D-565	20Ft	STAINLESS STEEL	TUBING	1/2 O.D. x ·049 WALL x 20FT	5·0
		18-8 AIRCRAFT		LONG.	
		HYDRAULIC QUALITY			
14D-566	25Ft	STAINLESS STEEL	TUBING	3/8 O.D x ·042 WALL x 25 Ft	8·0
		18-8			
		AIRCRAFT HYDRAULIC			
		QUALITY			
14D-567	2	STAINLESS STEEL	UNION	BRAZE-LOK	1.
				P/H 8xHB-SS	
14D-568	A/R	STAINLESS STEEL	SHIM	·03 x 5·5 x 13·25	NEG
14D-569	A/R	STAINLESS STEEL	SHIM	·03 x 4·5 x 13·25	NEG
14D-570	A/R			TREMCO JS 709H	
				TOTAL WEIGHT 4912·9 LBS	
		NOTE ALL ST STL FASTENERS & HARDWARE			
		THIS PL CALLS FOR TO BE PASSIVATED			

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
ANNA FEJES	AUG '74	D.B[illegible]LEM	Sep 74	[signature]	Aug '74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A

SHEET NO. 1 OF 6

DWG. NO. PL 6H

RECORD OF REVISIONS

SYM	SHEET	PART NO.	REVISIONS	APP.	DATE	SYM	SHEET	PART NO.	REVISIONS	APP.	DATE
A			FOR MANUFACTURE								

100

FATHOM OCEANOLOGY LIMITED
PORT CREDIT ONTARIO - CANADA

PARTS LIST

SHEET NO 2 OF 6

DWG NO PL 6H

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHTS
6H - 1			*	OUTER DRUM ASSY	452.5
6H - 2	1		*	INNER DRUM ASSY	209.6
6H - 3	1		*	FRAME ASSY	148.8
6H - 4	2		*	MOTOR PAD	13.2
6H - 5	2		*	LEVEL WIND SCREW	187.2
6H - 6	1		*	LEVEL WIND SCREW BUSHING	1
6H - 7	1		*	FAIRING GUIDE ASSY	31.2
6H - 8	1		*	FAIRING GUIDE ASSY	22.5
6H - 9	1		*	FAIRING GUIDE ASSY	27.3
6H - 10	1		*	FAIRING GUIDE ASSY	11.4
6H - 11	1		*	PATCH	52.2
6H - 12	1		*	FAIRING GUIDE PIVOT SHAFT	3.5
6H - 13		SPARE NO			
		* SEE DWGS FOR DETAILS			

COMPILED BY W. LIANG | DATE 10.7.74 | CHECKED BY A. FETES | DATE AUG '74 | APPROVED | DATE

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

SHEET NO 3 OF 6 — DWG NO PL 6H — Rev. A

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WT
6H-14	1		*	LATCH GUIDE	7.56
6H-15	1		*	LATCH GUIDE	5.8
6H-16	2		*	CABLE TENSION SENSOR BUSHING	1.
6H-17	6		*	FRAME CUSHION	3.9
6H-18	1		*	SPOOLING GUIDE	32.5
6H-19	2		*	SPOOLING GUIDE END PLATE	.98
6H-20	8		*	PATCH MOUNT CUSHION	1.6
6H-21	1		*	SPOOLING GEAR DRIVE ASS'Y	657.6
6H-1-10	16		*	ROLLER	3.2
6H-1-11	16		*	ECCENTRIC SHAFT	7.36
6H-1-12	16		*	ROLLER COVER	9.6
6H-1-13	16		*	RETAINING BAR	.08
6H-22	1		*	ANTI-ROTATION PLATE	.6

* SEE DWG FOR DETAILS

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
W. LIANG	JUL, 74	A. FETES	AUG '74	[illegible signature]	'74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT - ONTARIO - CANADA

PARTS LIST

A | SHEET NO 4 OF 6 | DWG NO PL 6H

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	
6H -500- - -	1		MOTO.	CENTRAL DRIVE MOTOR (SUBMERGED ROTOR)	
- - - -					
- - - -					
6H -501- - -	24	STAINLESS STEEL	SCREW	3/8 -16 UNC-2A X 1 1/4 LG	.54
- - - -		AISI TYPE 304		SOCKET HEAD CAP SCREW	
- - - -		QQ-S-763d		(MS 16995-82)	
6H -502- - -	46	STAINLESS STEEL	WASHER	3/8 NOM. DIA LOCK WASHER	.08
- - - -		AISI TYPE 304		(MS-35338-141)	
- - - -		QQ-S-766c			
6H -503- - -	16	STAINLESS STEEL	SCREW	3/8 -16 UNC-2A X 1 1/4 LG	.5
- - - -		AISI TYPE 304		SOCKET HEAD CAP SCREW (MS 16995-82)	
- - - -		QQ-S-763d		(CUT LENGTH TO SUIT AT ASS'Y)	
6H -504- - -	9	STAINLESS STEEL	SCREW	5/8 -11 UNC-2A X 1 1/4 LG	1.27
- - - -		AISI TYPE 304		SOCKET HEAD CAP SCREW	
- - - -		QQ-S-763d		(MS 16995-108)	
6H -505- - -	9	STAINLESS STEEL	WASHER	5/8 NOM. DIA LOCK WASHER	.06
- - - -		AISI TYPE 304		(MS 35338-145)	
- - - -		QQ-S-766C			
6H -506- - -	20	STAINLESS STEEL	SCREW	10-24 UNC-2A X 1/2 LG	.1
- - - -		AISI TYPE 304		SOCKET HEAD CAP SCREW	
- - - -		QQ-S-763d		(MS-16995-36)	
6H -507- - -	34	STAINLESS STEEL	WASHER	#10 NOM. LOCK WASHER	.01
- - - -		AISI TYPE 304		(MS-35338-139)	
- - - -		QQ-S-766C			
6H -508- - -	4	STAINLESS STEEL	BOLT	1"-8 UNC-2A X 7 1/2 LG HEX.	6.7
- - - -		AISI TYPE 304		HEAD (MS-35307)	
- - - -		QQ-S-763d			

COMPILED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
W. LIANG	JUL 74	A. FETES	AUG '74	J. Shishido	AUG '74

FATHOM OCEANOLOGY LIMITED
PORT CREDIT ONTARIO - CANADA

PARTS LIST

A | SHEET NO 5 OF 6 | DWG. NO PL 6H

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION	WEIGHT
6H-509- - -	4	STAINLESS STEEL AISI TYPE 304 QQ-S-766C	WASHER	1" NOM. LOCK-WASHER (MS 35338-148)	.07
6H-510- - -	4	STAINLESS STEEL AISI TYPE 304 QQ-S-763d	NUT	1"-8UNC-2B HEX CASTLE NUT	1
6H-511- - -	8	STAINLESS STEEL AISI TYPE 304 QQ-S-763d	BOLT	10-24 UNC-2A X 3/4 LG HEX. HEAD	.05
6H-512- - -	1	STAINLESS STEEL AISI TYPE 304 QQ-S-766C	RETAINING RING	WALDES-TRUARC, HEAVY DUTY # 5160-175	-
6H-513- - -	6	STAINLESS STEEL AISI TYPE 304 QQ-S-763d	BOLT	3/8-16UNC-2A X 3/4 LG HEX. HEAD	.14
6H-514- - -	1		*	CABLE TENSION SENSOR	
6H-515- - -	1				
6H-516- - -	64	STAINLESS STEEL AISI TYPE 304 QQ-S-763d	SCREW	8-32 UNC-2A X 5/8 LG CROSS RECESS 82° FLAT HEAD	.18
6H-517- - -	48	STAINLESS STEEL	SCREW	4-40 UNC-2A X 1/2 LG CROS RECESS 82° FLAT HEAD	.05

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED	DATE
W. LIANG	JUL. 74	A. FEJES	AUG '74		10/- 74

FATHOM [illegible]
PORT HOPE ONTARIO CANADA

PARTS LIST

A | SHEET NO 6 OF 6 | DWG NO PL 6H

PART NO.	QUANT.	MATERIAL	UNIT	DESCRIPTION
6H-518	2	STAINLESS STEEL AISI TYPE 304, QQ-S-763d	BOLT	¼-20UNC-2A X 1½ LG HEX. HEAD, PASSIVATED
6H-517	2	STAINLESS STEEL AISI TYPE 304 QQ-S-766c	WASHER	¼ NOM DIA.

NET WT 557.51 LBs

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
W. LIANG	JUL 74	A. FEJES.	AUG '74	ACS	